THE GEOGRAPHICAL JOURNAL

June-June 1909
R V. 33

PUBLISHED UNDER THE AUTHORITY OF THE COUNCIL.
EDITED BY THE SECRETARY.

VOL. XXXIII.—JANUARY TO JUNE, 1909.

LONDON:
THE ROYAL GEOGRAPHICAL SOCIETY, 1, SAVILE ROW;
EDWARD STANFORD, 12, 13, AND 14, LONG ACRE, W.C.
1909.

JAN 8 1971

PRINTED BY
WILLIAM CLOWES AND SONS, LIMITED,
LONDON AND BECCLES.

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No. 1. JANUARY, 1909. Vol. XXXIII.

THE RIVER PARANÁ:* AN ECONOMIC SURVEY.

By W. S. BARCLAY.

The river Paraguay and the lower Paraná run through the bed of an ancient estuary, such as is the river Plate to-day, its former shore-line being proved by limestone deposits as far north as Corumbá and Cuyabá towns, at the base of the Matto-Grosso plateau, which marked its limit. Over all this distance the rise in the river's bed is slight and very even over long distances. At Asuncion, over 940 miles from Buenos Aires, the river-level is only 204 feet above mean tide-mark at the Boca. Tropic rains, acting on the soft red sandstone of the central plateau and upon the Andean conglomerates, have further eroded a huge plain, averaging 300 miles wide. The continuity of the great flats which follow along the Paraguay river, joining the Plate to the Amazon basin over a divide of barely 1000 feet above sea-level, is no less remarkable a feature of South America than the Cordillera which overshadows them.

From the point where its headwaters unite until it is merged in the Paraná, the Paraguay river runs in an alluvial bottom as wide as the English channel, in which its main channel cuts a winding and capricious course. Long backwaters sweep round islands and sandbanks, recoiling upon the main stream in close horseshoe bands. Then comes a season of flood, when the whole basin is submerged, and as the waters subside it is found that unexpected cut-offs have formed new islands, while land-marks established elsewhere crumble away like a child's sand-castle before the incoming tide. When the Paraguay goes down in flood to the Plate, running 3 knots an hour, 20 feet deep and 20 miles wide, man can but adapt himself to its caprices and endeavour, as far as possible, to foresee them.

* Read at the Royal Geographical Society, November 16, 1908. Map, p. 116.

The banks of the Paraguay and lower Paraná are flooded for about three months out of the year. The flood-method of the river on either bank is distinct, though the net result is the same. On the lowlying western shore the quebracho forests of the Paraguayan and Bolivian Chaco close down to the river's brink, intersected only by grassy glades which mark overflow water-channels. Here in flood-time the river quietly spreads itself over thousands of square leagues of "llanos," in which the forest belts stand like islands; indeed, a quebracho grove in the Chaco is always called an "isla" by the natives. The barrancas which bound the eastern banks of the river are higher, and are not in normal times subject to overflow; but streams descending from the central water-parting of Paraguay and Matto Grosso, when impeded in their outlet by floods on the main stream, back up against the inland hill spurs in extensive lakes and swampy lagoons which cannot drain away till the Paraguay falls. Thus on either hand, in a succession of forest and pampa, morass and lake, we follow the banks of the river to its navigable limit at Corumbá, and, if seasons favour, to Cuyabá also. Such is the Paraguay:—

> "Shallow, disreputable, vast,
> It sprawls across the western plains,"

to paraphrase Kipling; an open door leading to fertile solitudes; one of the fairest-seeming and most disappointing waterways that ever tempted man to trade on its goodwill.

The Alto Paraná tributary, in its lower reaches, where it skirts northern Corrientes, seems at first sight very similar in character to the Paraguay. Less than 100 miles up-stream from their junction, however, rocky reefs, or "retingas," cross the stream at right angles, composed first of a hard sandstone conglomerate, later of basalt. Passing Posadas, capital of Misiones and collecting depôt of all up-river trade from this point, the Alto Paraná is penned between the Misiones and Paraguay hills, and its width, hitherto anywhere between 2 to 5 miles, suddenly shrinks to 1300 yards. Densely wooded shores slope to a current running 5 knots an hour. The mean height of the river is indicated upon its banks by a graceful line of waving bamboo, which is only broken where some little stream comes tumbling in haste to join the parent river, bars of white sand marking the occurrence at no great distance of a fall over the basalt shelf which straitly bounds the channel. Some falls are actually to be seen from the main river; and the smoking column of mist which crowns the Iguazú falls is plainly visible only 12 miles away. Thirty miles below the Guayrá cataracts, in boiling whirlpools and cross-currents running 15 knots an hour, navigation ceases. Above Guayrá the hills retreat, the river once more widens out, and from here to Uberaponga * falls, a distance of 400 miles, the Alto Paraná,

* Uberaponga, the gorge of shining waters.

which so far has captured numerous but unimportant affluents (excepting the Iguazú), receives four-fifths of its total volume. Above Uberaponga fall the Rio Grande and Paranahyba rivers which form its headwaters are again navigable by canoe, but, like the Paraguay river above Corumbá, these reaches lie beyond the present scope of commercial enterprise.

The area controlled by the section of the Alto Paraná above Guayrá falls is thus seen to be a very large one. An abrupt scarp, indicating the main axis of the central hills of Paraguay and Matto Grosso, dominates the western edge of the basin, but drops immediately to much lower levels, and so continues in a gentle downward slope to the bed of the river. These western hills are set upon a base of Silurian and metamorphic schists, which, on the side facing the Paraguay basin, show contortion varying from the horizontal to 70° uptilt. At about 700 feet from base-level the igneous rock is topped by a much-denuded sandstone plateau, whose average height of 3000 feet is continued across numerous gaps worn by lateral streams, the average rainfall of 80 inches being in this region often supplemented by local tropic cloud-bursts. On the higher levels and lying parallel to the surface of the plateau are intercalated strata of a ferruginous pudding-stone conglomerate, varying from half a metre to a metre in thickness. The soil upon this western bank of the Alto Paraná valley is red, sandy, lacking in lime, with little or no clay, and rendered still more porous by mould from the dense, mixed forest which covers the major part of the basin.

The streams entering the Alto Paraná from the east take their rise in the Serra do Mar, or coast mountains of South Brazil. These it would be more accurate to describe as an igneous plateau presenting a sheer cliff face to the Atlantic coast, along which the highest levels lie, but sloping backward to the interior valleys of the Paraná basin in a series of minor steppes. This volcanic groundwork is overlaid by a massive, deeply eroded sandstone cap, which attains its maximum altitude at 4500 feet in S. Paulo and Paraná states, but tapers away and finally disappears altogether in the south and southwest hills of Santa Katarina and Misiones in descending altitudes of 1800 to 1500 feet. Its highest levels show an open savannah country, which vanishes as we push inland from the coast, when projecting dykes of the ground basalt are thrust out spur-like toward the wooded Paraná basin, determining the course of the major tributaries into the main valley. The phenomenon of inland drainage in South Brazil is very striking, since it forces rivers like the Iguazú, rising within 30 miles of the Atlantic, to turn their backs on blue ocean, and journey 1500 miles before entering salt water by way of the Plate—a fact of very serious import to the whole region involved.

This upper section of the Alto Paraná is set in the interior like a lake. Its tributaries penetrate, like fjords, far into the depths of a dense

forest, and on every side it is hemmed in by high hills. The rugged buttresses of Minas Geraes, which force its headwaters through the Uberaponga gorge, rise northward, layer on layer, to the Serra dos Pireneos. East and west the Atlantic plateau and the hills of Matto Grosso look to one another across 500 miles of forest valleys. At Guayrá, the Serra do Maracayú stretches across from Paraguay to join hands with the Serra do Piquiry on the opposite side in the attempt to bar a southern exit. The bed of the Alto Paraná at Guayrá lake is some 700 feet above sea-level. Near Uberaponga fall, as at the navigable limit of all the great tributaries which enter the Alto Paraná in the intervening stretch, the height is roughly 1000 feet. From this altitude, the levels everywhere rise rapidly up to 1500 feet, attaining their maximum of 3000 feet in a sudden final uplift. The word "basin" therefore applies literally to this great valley, whose enclosing rim rises at every point from 1000 to 1500 feet above its bottom. The only outlet is by the Guayrá cataracts, where the river, gathering head-power in a funnel-shaped lake 4½ miles long, bursts through and down the southern slope of the Maracayu hills. The outlet gorge at Guayrá lies in the same general direction as the Paraná river, that is, nearly due north and south, and follows the principal current, which here runs along the west or Paraguayan side of the lake. For 56 miles above Guayrá the Alto Paraná is split into two channels by a narrow rocky island in mid-stream. The tail of this island finishes in the Guayrá lake at an angle which throws the current by the eastern shore of the lake very considerably out of the straight line of the gorge. The entrance of the Piquary river has further deflected the eastern shore-line, which now slopes back at some 45° to the line of the main stream, giving the lake the "funnel" formation referred to (see sketch-map, Guayrá falls).

The rapid erosive action of such cataracts upon their stream-bed produces a marked tendency, in all this region, for the head of a fall to outstrip its flanks. This process continues until the unequal ratio of progression is checked either by a resumed horizontality in the river-bed, or by the widening of its bank, which permits a portion of the water intercepted by the head gorge to flow past; quickening the side cascades into a renewed activity which may, in the absence of further complications, enable them to work their way up-stream till they are even with the head-fall again. The main cascades naturally wear their way back along the weaker fissures in the bed-rock, and if the rate of progression is rapid the more resistant rocks are left practically untouched. In other words, a typical Alto Paraná fall works its way up-stream in a series of fits and starts, strewing islands in its wake. The normal rate of this process is much hastened by the sudden changes of level to which the Alto Paraná is liable. Great floods such as occurred in 1889 and 1905 are the exception, but every year the river rises and falls in violent

SERRA DO MAR, BRAZIL: BASALT CLIFF FACING THE ATLANTIC.

MISIONES: THE PINELANDS.

fluctuations under tropic rain from April to the end of June. The river-bed at Guayrá, as in all instances where the Alto Paraná finds a permanent obstruction to its course, is compact of a close-grained basalt, whose surface planes exhibit a certain amount of cleavage and cross-jointing. Degradation along the upper layer is therefore easier than in the more basic underlying rocks, often causing a midway shelf and double fall, of which a typical example is shown in the Argentine horseshoe of the Iguazú. The masses of tumbled rock which strew the upper portion of this fall illustrate the rending force of the currents and the possibly explosive action of compressed air during heavy flood, proving that the rapid erosion of the stream-bed is due to these sudden hammer-blows rather than to long-continued processes of attrition.

IGUAZÚ FALLS, SHOWING HALFWAY SHELF WITH BASALT BLOCKS BELOW HEADFALL.

Some acquaintance with the working plan of the Guayrá cataracts is necessary, since their area is too extended to be viewed from any single point upon the shore. The head fall has already eaten its way back 400 yards into the lake from the narrowest point of the outlet gorge. A secondary development is fast heading back along the eastern shore of the lake, where the swirl of water round the tail of Guayrá island, reinforced by the current of the Piquiry river, is responsible for the formation of the "Sete Quedas," or Seven falls, extending along this side, from the head of the main gorge to its base. The height of these secondary cascades varies from 50 feet at the upper end to 90 feet at the southern

extremity of the funnel; but in high flood these heights are reduced by fully two-thirds, since a few inches more water on the wide surface of Guayrá lake make a difference of many yards in the narrowest part of the outlet gorge. It is this portion, and not the actual falls, which affords the real spectacle. Including the upper cascades, the total fall from upper to lower river at Guayrá is 310 feet. At one point the cliffs are only 200 feet apart, the distance that a practised hand may throw a stone with ease. The whole impact of the Alto Paraná, backed by the reserve power of the great tributaries which have joined it from the Brazilian uplands, chafes and roars through this strait gateway. The volume of water in normal river is reckoned at 13,000,000 cubic feet * per minute, an estimate which may be doubled and even trebled in time of flood. The Guayrá cataract is the mightiest, because it is the most compactly frantic water-power awaiting man's harness on earth. The current piles up in the centre with a corkscrew action, ever shifting to the side, and diving down again into mid-stream, where, momentarily imprisoned in caverns and pot-holes worn by long-vanished side falls, it returns to the surface in spuming eddies which leap 12 to 15 feet high, bursting with the noise of dull cannon to spread their outer circles to the shore, and so repeat. The whirlpool rapids of Niagara, where Captain Webb lost his life, are a quiet duck-pond by comparison.

From the smoking cataracts of Guayrá to the lone loveliness of the Iguazú falls, half concealed by the crowding forest, there lie but 125 miles; yet so scored are the river's banks on either hand by cascade and torrent, that this stretch might well be called Waterfall-land. The Iguazú river in its interior course down the coastal plateau is navigable for shallow craft from Port Union, connected by rail with Curytiba railroad, as far as Salto Caxias, where its bed drops another 80 feet, some 68 miles distant from the Paraná. Below this point constant reefs render it unnavigable down to the final and greater fall to which the Iguazú gives its name, where it exposes the lower shelf of basalt directly overlooking the Paraná. The Iguazú falls cover a large area, being approximately 3300 yards in length. They may be divided into two sections, the Argentine side falls, and the upper or Brazilian head fall; for at this point the river forms part of the northern boundary of the two republics. The head fall, whose cascades have originally emerged from a gorge 200 feet deep and only 300 feet wide, occurs on a very acute horseshoe bend. The side falls are working more slowly, their present action being chiefly confined to times of flood, and a long chain of islands overlooking the main channel shows how they are being gradually starved out of existence by the rapid advance of the head.

Nothing brings out more clearly the essential difference in character

* Niagara is reckoned at 28,000,000 cubic feet per minute.

between the Paraguay and Alto Paraná rivers than their action in time of great floods. Taking a section along the 24th parallel of south latitude, we find that on May 25, 1905, the Paraguay river in front of Asuncion rose 12 feet, inundating the Chaco through its Pilcomayo tributary nearly to the base of the Andes. Following the same parallel of latitude, we find that the Alto Paraná, at a point between the Iguazú river and Guayrá, rose 157 feet in its steeply confining banks. At the mouth of the Iguazú the Paraná rose 146 feet, damming back the water pouring through the narrow outlet gorge of the falls, which accumulated behind. In consequence, during five days the wide bay eroded by the Iguazú falls filled up to its total height of 210 feet, the cascades became flush and disappeared, while the river overflowed in all directions to the Paraná through the surrounding forest, a distance of 7½ miles.

The ancient province of Guayrá, founded under the auspices of the Jesuit order in pursuance of their "spiritual conquest" of South America, embraced the whole of the upper valley of the Alto Paraná, and its limits reached to the rim of the mountains overlooking the basin, as here set out. The geographical prescience of these pioneer missionaries selected Villareal as their centre, situated 94 miles up-stream on the Ivahy, a river which enters the Paraná from the east about an equal distance above the Guayrá lake. In this secluded spot, from whence they could communicate with the whole stretch of navigable waters in the upper basin, the Jesuit fathers, before the repeated raids of the Mamelukes destroyed their town in 1631, had gathered 9000 river-Indian converts. If we add to these twice the number of river tribes with whom they must have been in touch, we can reckon as 30,000 roughly the aborigines among whom the barriers of tribal intercourse were thus lowered. If this count seems small compared with other estimates, it must be remembered that the means of subsistence which the forest region of the Alto Paraná forests affords to aborigines incapable of cultivation is very small. Apart from wild honey, berries, and a few nuts, the main dependence of the river tribes is on fish. These are difficult to catch in time of flood, and in the absence of salt throughout this entire region, impossible to preserve. It may be worth mentioning that I have both seen and had reported to me several cases of leprosy on the Alto Paraná, a disease which is unknown to the native tribes living among the swamps of the Paraguay and Chaco rivers, where, in addition to fish, incredible numbers of wildfowl are easily caught. This appears in some degree to confirm the theory that a continued diet of stinking fish—in which condition it is preferred by the native tribes—is a predisposing cause of this disease.

Finding it therefore impossible, with their plantations laid waste, to maintain so large a following in the forest, and fearing total destruction, Padro Montoya, the then Vicar-General of Guayrá, determined to place the barrier of the Guayrá cataracts between his converts and

their pursuers. To this end he led a desperate exodus down the eastern bank of the river with 7000 followers, of whom over 3000 are reported to have perished of hunger on the way, finally establishing the remnant in the Argentine province, which chronicles that historic flight in its name of Misiones. Here, with a river base clear to the sea, and the products of forest plantations supplemented by cattle raised on the pampas, the missions flourished exceedingly, so that in 1767, the year when the order came for their final expulsion, an old census credits the Reductions clustered along the banks of the Uruguay and Alto Paraná near this favoured spot with 93,186 Indian converts. The proselytizing zeal of the Jesuit Fathers created more ethnical confusion on the Alto Paraná than even the final persecutions which dispersed the Missions. In the chronicles of Padre Lozano we find the following note: ". . . and, moreover, this cliff (of the falls of Iguazú) has been to the Indians that dwell there as it were a natural defence, so that the bold assaults of Spanish valour have never penetrated to their retreat; *nor indeed had any stranger set foot in their land until it was conquered to the service of Christ by the arms of the Evangelist and the unfaltering constancy of our own Mission Fathers. . . .*" A few aboriginal tribes are still scattered through the north of Paraguay and upon the fringe of the forest that covers the Alto Paraná basin, but none are now free from the taint of mestizo blood. The Guarani tongue forms a species of *lingua franca* for the native races throughout the lower valleys of the Paraguay and Alto Paraná rivers, upon the uplands of Paraguay, and in the north of Corriantes province—in a word, wherever the Jesuit missions, whose record is preserved to us in extensive ruins, are known to have been firmly established.

The territory of Misiones, with its triple water-parting to the Iguazú, Uruguay, and Alto Paraná rivers, is interesting not only for the historical associations just noted, but because it is the only portion of Argentina which shares the tropic conditions of South Brazil. Geologically, it is a volcanic spur, intruding from the Brazilian coastal plateau into the pampean deposits of the Paraná delta. The central divide, or sierra, of Misiones, at altitudes rising from 1500 to 1800 feet, looks across to the Caá-Guazú * range of Paraguay, the densely wooded valley of the Paraná which lies between presenting a diminished replica of the northern basin above Guayrá. Between the river-bank and the Misiones uplands, and about 300 feet above mean river-level, lies an undulating shelf from 9½ to 13 miles wide, where a heavy cedar and hardwood forest offers the only obstacle to travel. About halfway across this shelf traces of fine sand are met with in the stream-beds, thickening at a few hundred yards from the shore into the loose sandy barrancas noticeable from the Paraná itself. Upon the Misiones

* Caá-Guazú, "coarse grass" in Guaraní dialect, alluding to patches of savannah found at height.

highlands, however, no trace of sand is visible, while the rocks upon which it rests are of a compact, igneous character, entirely free from sandstones. The sandy appearance of the Misiones bank is therefore due to surface silt, deposited by the river floods during the gradual wearing of its bed, and does not, as on the Paraguay side, afford a true indication to the geological formation of the country behind.

The rock formation of Misiones, indeed, as far as a dense forest allows it to be seen, is entirely volcanic. The uniform level which the numerous lateral spurs maintain with the crest of the divide suggests an original upheaval, planed off at or near water surface, and later heavily denuded by subaërial agencies. Slaggy, scoriaceous, and vasicular lavas, indicating flow-structure, show freely on the surface, and an amygdaloidal basalt, known locally as "piedra tacurú," or ant-heap stone, occurs all along the divide in fragmental boulders and bosses. Its blow-holes are partially filled with crystallized silicates, and show traces of sulphur. These blocks are freely blended with common lavas, looking like brick-red butter spread upon brown crusty bread. The constituents into which this rock dissolves are, in order of importance, iron, magnesia, and potash, with some soda and traces of lime. The hill streams come down milky-white from the leaching out of these minerals. This rock, which prevails on the southern foothills of Misiones and on the slopes facing the Uruguay river, eventually weathers into a deep-red clay soil, often 30 feet thick, in which the Brazilian pine,* the yerba mate,† and other trees with long tap-roots flourish, while exquisite tree-ferns grow luxuriantly in their shade. Within the pine-belt occasional open spaces are met with—islands of grass in an ocean of forest. Upon the forest fringe near the southern foothills of Misiones, pampa land is being formed by a rapid denudation of soil from the tree-roots of exposed woodland belts. The isolated, forest-girt "campinhas," however, have been originally created by lack of drainage, on the crest or in a gap of the divide, offering a highly mineralized surface hard-pan which has been unfavourable to the germination of seeds from the surrounding forest. Beneath the upper lavas the main body of the Sierras is compact of a finely grained dolerite, showing fracture like a steel ingot and intermediate to a dense, greenish-black diabase, which forms the bed-rock of the whole and shows in reefs across the Paraná. This hard underlying formation is responsible for the steep slopes on the side facing across the Paraná valley, and weathers into a shallow, light yellow soil, supporting a very varied forest. Its distinguishing vegetation is the bamboo, of which there are five main varieties, from the branching giant to a creeping variety resembling smilax. This last is greedily eaten by stock, and the traveller depends on it to feed his mule, the only animal that successfully resists the steep, rough forest trails.

A review of the Alto Paraná both above and below Guayrá falls

* *Araucaria Brazilensis.* † *Ilex Paraguayensis.*

thus shows that the river does not run in an eroded sandstone bed, as might be easily surmised from examination of the banks of the stream only, but rests upon a bottom of exposed igneous and volcanic rock, while the course of the river has resulted from a tectonic movement, of which we find abundant evidence in its immediate vicinity. A first upheaval drained the lake of the upper basin beyond Guayrá, and spread sediments of a pre-Tertiary origin over Corrientes as far south as the red sandstone quarries of Mercedes; while the subsequent uplift which raised the Misiones hills, deflected the river westward at Cerro Cora (just above Posadas), drained Corrientes, and settled the delta 500 miles further south. "The great inland valley, which follows the plateau of Curytiba, has suffered great displacement near Colonia Theresa (upon the Ivahy river), where the sandstone has come under metamorphic action."* This fracture line occurs along a plane whose height roughly coincides with that of the Misiones hills, *i.e.* 1500 to 1800 feet above sea-level. Not only is the final scouring of the lower valleys due to this subsequent movement, but there appears evidence that the precise location of the river-bed between Guayrá and Posadas has been determined by rifts or faulting in the ground-bed, due to the action of the later lavas superimposed upon the Misiones bank. Both at Cerro Cora, where the hills close in upon the river-bank, and on the highlands of Misiones between Fracran and San Pedro, a spheroidal formation is very noticeable, pointing to columnar shrinkage of the basalt with subsequent cross-jointing. The whole ground at these places is set in a mosaic resembling half-peeled onions, the largest rather bigger than a man's head. Moreover, large crystals, often showing prisms an inch long and so arguing formation at depth, are found at the base of the basalt cliff overlooking the valley (as, for instance, below the Iguazú falls), and by the Misiones shore, but never upon the highlands. Along this reach of the river, also, there are certain deeps which a 100-fathom line has failed to sound. Native pilots exaggerate them as bottomless, and local legends attest their persistence in the same spot. No such depths occur at any other point on the Paraná or Paraguay rivers. The central channel of the Alto Paraná along this portion of its course appears to run in a series of long planes sloping up to the intercepting ground reefs or islands. Owing to a slackening flow, the grosser materials held in suspension by a 5 to 7 knot current are deposited immediately above these passes. Once the obstacle is passed, however, a miniature chute takes place below the surface, and these pot-holes are scoured deep in the veins or weakened fissures of the rock which accompany the river's course.

The Misiones hills die away in rolling grasslands which form the

* Survey from Curytiba to Miranda in the years 1872–1875. Work begun under Captain Palm, who died during the survey. For the report relating to this survey, I am indebted to Mr. Jason Rigby, who took part in it.

high shoulder of north-east Corrientes, but the bed-rock which underlies them persists in a south-westerly direction. It forms the base of the "Tres Cerros" peaks, outliers dominating a level waste of malezal swamp; 63 miles below Posadas the igneous ground-sheet of the Paraguay hills also crosses the Paraná in diorite reefs at the passes of Apipé and Carayá, and joins the Misiones rock along the eastern shore of the Ibera lagoon at about 60 feet from surface. The Curuzu-cuatia* tableland in Corrientes marks the southern limit of volcanic intrusion into the Paraná delta. A diamond drill bore in the plaza of Curuzu-cuatia town gave the following geological section:—

From 1–15 feet from surface †	...	Disintegrated sandstone and alluvium.
„ 15–40 „ „	...	Grey sandstone.
„ 40–140 „ „	...	Red sandstone.
(Here a few inches of greenish sulphate and potash deposits.)		
From 140–250 feet from surface	...	Black amorphous basalt.
„ 250 „ „	...	The bore was being continued in amygdaloidal basalt.

Another trial boring for water made at the opposite side of the town gave a similar section, save that the amorphous black basalts continued uninterrupted from 140 to 800 feet depth. At this point the bore was discontinued without striking water.

The Apipé, Yaciretá, and Carayá rapids, formed by the reefs crossing the river below Posadas, impose a limit of 3-feet draught on all craft making trips in low water between Posadas and Corrientes. Above this barrier 14 feet of water is always available on the Alto Paraná to within 19 miles of Guayrá falls, and this stretch is constantly traversed by powerful steamers engaged in the yerba mate trade, and capable of steaming not less than 10 knots an hour to cope with the currents met in the higher reaches.

No one personally acquainted with the sharply contrasted topography of northern Corrientes can doubt that, before the river subsided into its present channel at the foot of the sandy barrancas which succeed the Apipé rapids, an important branch of the Alto Paraná traversed the depression now occupied by the Laguna Iberá. This swampy lake runs from the Apipé rapid in a south-west direction across the province to the foot of the Curuzu-cuatia highland, paralleling the basalt sheet above alluded to. It is 100 miles long, averages 15 miles wide, and covers a total area, excluding tributary swamps, of 1620 square miles. It furnishes the headwaters of the Mirinay and Corrientes rivers, which mark ancient and much more extensive drainage areas flowing round the base of the Curuza-cuatia highland into the Uruguay and lower Paraná respectively. A collector of skins and egret feathers, whom I met upon the Iberá, claimed that he had traversed by canoe the whole distance from close to Ituzaingo town, situated below Apipé,

* Anglice, sign of the cross. † Surface is 270 feet above sea-level.

down by the lake and the Corrientes river to the town of Esquina, on the lower Paraná. This chain of water shows that the north-west corner of Corrientes, the ancient delta of the Paraná, is really an island whose higher portions, on the shores of the present river, stand some 50 feet above the level of its ancient cut-off.

The Iberá laguna is not the only swampy water-channel which isolates North-Western Corrientes, affording additional proof, if it were needed, of a former passage of the Paraná at this point. Paralleling the Iberá westward is the Santa Lucia, covering an area of 240 square miles. The St. Lorenzo, a little further west still, has only 80 square miles laid waste. Only a narrow strip of sandbank at first divides these systems, widening into a pond-dotted plain as the swamps contract into rivers, which force a way through the western border of the province and fall in due sequence into the lower Paraná. The Laguna Iberá, however, as it is the largest, is also the most interesting of the three channels, owing to the prevalent fable and superstition concerning it—to an extent amazing when the simple nature of its formation and comparatively easy access to its shores is considered. It is said to be impenetrable, and its watery wastes peopled by fugitive Indians from the old Jesuit missions, who still inhabit its floating islands and raise cattle on them. These amazing tales obtain credence,* not only in Buenos Aires, but in local centres not 30 miles distant from its shores. In point of fact, a low hog's back of earth runs down the eastern shore, forming the main cattle-route south as far as Paso Claro, an open stretch of water from which the Mirinay river takes its outlet. Numerous estancias are set along this raised bank, whose cattle pasture on the flats to the eastward, but in times of drought, when the swampy flats are rapidly converted into arid, dusty plains, the herds are watered in the Iberá itself in long lanes cut to permanent water through the fringing reeds. The open water at Paso Claro is divided into three lagoons, each about 5 miles by 3, connected by reed-covered channels through which a shallow canoe can easily force its way. These conditions are repeated northward about halfway up the lake, and form the only open water exposed in all its surface.

A slight current, due possibly to the south-east prevailing wind, sets over toward the western shore. This favours an extension of the eastern fringe of rushes, which gradually grow out till in the deeper water they form masses of floating sudd. During prolonged gales

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* ". . . Various attempts have been made to explore it, but all have failed. Tradition relates that its islands were inhabited by Indian nomads, and that the open ground on these islands was even stocked by cattle. *It has never been possible, however, to verify this statement . . .*" (see p. 10, descriptive notes on the Map of Corrientes, 1898, by Zacharias Sanchez, Chief of Argentine Government Boundary Surveys).

LAGUNA IBERA, CORRIENTES: FLOATING ISLAND OF SUDD; OUTLET OF ... RINAY RIVER IN DISTANCE.

ENTRE RIOS: CROSSING THE RINCONES.

portions of this sudd are broken off and drift slowly to the western side, where they ground in shallows and grow in time clumps of laurel and willow, sheltering an occasional deer or jaguar,—but no Jesuit cattle. Seen at intervals across a waste of reeds, these tree-clumps account sufficiently for the "island" theory, although really forming part of a fast narrowing shore-line. The maximum depth of the lake does not exceed 18 feet, and it is fast silting up. The only real island I found in the lake was a small projection, perhaps 10 yards square, compounded equally of grey mud, fine sand, and the shells of a small common bivalve, the whole a very typical Pampean formation. The specific gravity of this "rock" was very light, not exceeding that of pitch-pine lumber. The tiny island was concealed within a ring of rushes, upon whose roots it had obviously climbed to the surface, and boasted a stunted "ceibo" tree, from whose branches two beautiful white egrets sailed away as we disturbed their solitary breeding-ground.

The word "swamp" inadequately describes the different varieties of water-logged alluvium which retard the harassed traveller in his journeyings about the Paraná river. Since the province of Corrientes, both in name and fact, presents an epitome of them all, it may not be amiss at this stage to summarize their most striking aspects.

A "Malezal" swamp is caused by the drainage of water over an extensive plain having a very slight almost imperceptible slope. The slow movement of the water is sufficient to wash out the looser earth, leaving flat-topped, turf-bound clumps outstanding in sections. The height of these sections from floor-level indicates the exact depth to which the plain is submerged after heavy rain. Its appearance at a short distance is that of a green meadow where cattle are standing knee-deep in grass, but since no grass grows on the floor between the sections, the grazing value of these plains, which extend for hundreds of square leagues on the uplands of Corrientes and Paraguay, is obviously only one-half their apparent area. A malezal is sure evidence (1) of a high proportion of fine sand in the soil, (2) of underlying rock or clay hardpan at no great distance from the surface.

"Bañado" is any undrained hollow where the soil held in suspension by flood is deposited, usually marked by great clumps of rushes. It dries up like the "malezal" during drought, but is apt to leave dangerous mud-holes.

"Estero," a deeper "bañado," of which some portion is permanently under water.

"Laguna," the open water collecting drainage of the above.

Thus the malezal is really a swamp of erosion, tedious but not dangerous to cross, and of definite grazing value. The succeeding varieties, true swamps of deposition, present always serious, sometimes fatal, obstacles to the horseman. They are breeding-grounds of tick and other pests to stock, and are valueless save for their precarious

water-supply. Every variety of swamp, however, improves rapidly on being heavily stocked and trampled by cattle.

The northern shore of Corrientes below where the river abandons its basalt bed, is composed, as already noted, of red sandstone barrancas, surmounted by white sand-dunes of a lighter texture. Towards the interior this loose upper sand dies away in wide malezales, feeding the ancient cut-offs already described, but close to the river-bank the sandhills are dotted with rainwater ponds, which drain down to the river in short watercourses. A good example is the Tranquera de Loreto, opposite the head of the Laguna Ibera near Ituzaingo town. This gully, like every other work in this region preceding Argentine occupation, is attributed to the Jesuit missionaries. The Jesuits certainly had a cattle station at this point, for one of their great hardwood crosses is still standing in an orange orchard near. But the Tranquera de Loreto was probably not an engineering scheme, but only a simple boundary ditch dug by some settler before the days of wire fences, which has deepened and worked its way back from the river coast till it is now 2000 yards long, 230 feet wide, and 50 feet deep. The head already intrudes into the "malezales" which feed the Iberá lake, and the process of erosion is so rapid that the side timbers of the wooden bridge thrown across it have to be constantly renewed, being under repair for this purpose at the time we crossed. At this point I was able to prove a difference of 30 feet between the water in the malezales and the normal level of the Paraná river alongside. If this northern catchment area of the Iberá were thus drained back into the Alto Paraná, and the sudd which chokes the southern outlet of the Corrientes and Mirinay river cleared, there is little doubt that many thousand square miles of excellent land might be reclaimed in the heart of a fertile province, which are now laid waste by this over-dreaded swamp.

The gradual emergence of Corrientes and Entre Rios provinces, at the time when the Paraná Delta was shifting from the south-west corner of Paraguay to its present site near Buenos Aires, can be easily traced on the shore section exposed between Corrientes town and Diamante. Opposite "Tres Bocas," the triple junction of the Alto Paraná, Paraguay, and Bermejo rivers, the shores of Corrientes show on the surface the black earth of the Chaco, sandwiched between the lighter surface dunes and red lower sandstone already described. Halfway down the province a yellow clay marl is superimposed, and passing the frontier of Entre Rios beds of gypsum are disclosed of irregular extent, 2000 tons monthly being shipped from near the little port of La Paz to the plastering trade in Buenos Aires. At Paraná town the gypsum is gone, giving place to thick limestone beds, surmounted in their turn by strata of enormous oyster-shells, 60 feet above the river-bed. Passing Diamante, situated 40 miles south of Paraná town, at the base of the

ENTRE RIOS: THE SANDHILLS OF THE RINCONES.

THE PARANÁ RIVER. FROM PARANÁ PORT, SHOWING SHIFTING ISLAND AND LIMESTONE BLUFFS.

main water-parting of Entre Rios the limestone cliffs turn abruptly east, and in front of them stretches a series of swampy islands and narrow, sluggish, intersecting channels, extending out to the farthest limits of the Delta; a borderland between dry earth and water, whose little-explored recesses are well described under the title of "Los Rincones," or the Corners of Entre Rios.

From Diamante the limestone escarpment runs inland across the department of Victoria with such clearness that locally it is referred to as "La Costa," or coast-line. On reaching the delta of the Gualeguay watercourse (draining Entre Rios from north to south), the limestone disappears, but is renewed in embryo by extensive shell mounds derived from a small uni-lateral bivalve, which are exposed on the surface of the country to within a short distance of the Uruguay. At a distance of 20 miles south of the line along which the limestone escarpment and 15 to where the succeeding shell-heaps occur, a broad uninterrupted belt of sand-dunes stretches from one side of the province to the other. This belt is the main high-road across the Rincones, and, until the recent extensions of the Entre Rios railway, formed the only means of escape in time of high flood for the thousands of cattle grazing the lush southern pastures. Further south still other low sandhills appear in confused lines, the majority still below flood-level, denoting the bays and bends into which the Paraná was forced by the mass of material it brought, and is still bringing down, to the confusion of its own pathway to the sea. These vagaries have been skilfully utilized by the Entre Rios railway to carry its lines to Ibicuy, a deep-water port on the Pavon branch of the main channel, whence a train-ferry service, the first in South America, now carries cars without breaking bulk across 37 miles of river to Sárate, on the Santa Fé shore, and so by rail again to Buenos Aires.

These sandhills, due to parallel deposition along the shores of abandoned channels, invariably surprise the Argentine traveller, who is accustomed to consider Entre Rios as a "black-earth" province, and has hitherto fetched all his sand to Buenos Aires from the neighbouring republic of Uruguay. At a depth of 5 to 6 feet below their general surface-level (excluding wind-heaped dunes) the sand-beds overlie a compact alluvial clay. A rainfall of 40 inches per annum, soaking down to the surface of this clay, is saved from evaporation by the loose, sand-blown surface, which acts as a mulch, checking capillarity. The reservoir of water thus obtained is so efficient that during a three-months' summer drought in 1907, I saw 4000 head of stock, consuming about 50,000 gallons a day, abundantly supplied from a pond in the sandhills, 30 yards wide and only 3 feet deep. The water was piped down to the flats, 50 yards distant and 10 feet lower, where brackish well water was only obtainable by digging another 12 feet, the total distance from permanent lower to upper "reservoir" water being thus

22 feet. The ground leading up to the sandhills is extraordinarily level over wide areas. I have seen 40 miles of country buried an even foot under water after heavy rain. The sandhills of the Entre Rios Rincones are thus alternately dry island refuges in what appears to be an open sea, or they are sweet-water oases dominating a drought-stricken plain—a somewhat unique function which renders them indispensable to the farmers of that vicinity.

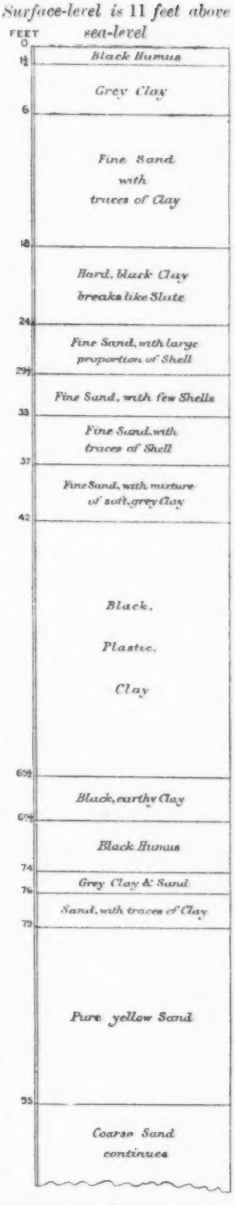
The phenomenon of parallel deposition along channel banks is exhibited through every phase of the lower Paraná valley, alike on the greatest and most diminutive scale. The heavier material is naturally deposited along the shore, the lighter silt and sand spread in a diminishing fan inland. The shape of an island, therefore, in the delta is that of a saucer set on a table, the raised rim of the saucer, bound by reeds and willows, being the shore-line fronting the river; and it is the normal condition within the flood area of the lower Paraná valley to find dry land bordering the river channels and swamp in the background. Thus on the Chaco shore we find that many small tributaries do not join the main stream directly from the west, but skirt southward till they find an outlet through this shore deposit.

Save on the Corrientes frontier and by the Uruguay river-side, an even bed of permanently water-bearing white sand, so fine in texture that it passes easily through the minutest gauze, underlies the whole of Entre Rios province. This is called "Montevideo sand" by well-borers, who claim to meet the same material at that portion of the Plate estuary. This is the ground-bed of the province, established before the advance of the delta. It is found at an almost uniform level of 100 feet above sea-level; that is, if the ground surface is 270 feet above sea-level, this white sand and water will be found at 170 feet depth from surface. The highest levels in Entre Rios are to be found in a section taken across the province from Paraná town to Concepcion del Uruguay, marking the culminating point of the deltaic flood. The granitic rock which forms the eastern border of the province dips under the Uruguay river and terminates some 38 miles inland. This, in conjunction with the western limestone escarpment, has thrown the drainage of the province into the centre. Working in soluble clays, the three principal rivers, Feliciano, Gualeguay, and Gualeguavchú, running north and south, have already worn a bed over 100 feet from surface throughout, but the flat water-partings which divide their valleys keep fairly constant at about 260 feet above sea level on the west to 120 feet in the east. The formation of Entre Rios is therefore composed, up to 100 feet above sea-level, of a uniform bed of fine estuarine sand, upon which later alluvials rest in a sheet diminishing from west to east; proving the infinitely greater agency of the Paraná, as compared with the Uruguay river, in building up the Argentine Mesopotamia.

If we classify the alluvials composing Entre Rios as recent, then the

islands of the "Rincones" may be fitly described, in a geological sense, as raw. Even as great floods are the master blows which break down the land-mass of the watershed in the north, so they are the cause of extensive building-up here in the delta, when forest wrack and whole acres of rushes and sudd strand along the main channel banks, building each year higher dams to protect the flood areas inland. The Alto Paraná is liable to rise between March and June, and reckoned from Posadas its water takes about a fortnight to affect the levels in the delta. The Paraguay, fed by melting of snows from the Andes, rises from May to the end of August, and passing Asuncion the difference in level takes about three weeks to reach the delta. Major floods come when the culmination of these two rivers coincides, and exceptional floods when during such coincidence the waters of the Plate are backed up by prolonged south-easterly gales, impeding the free outlet of flood-water into its estuary.

The potency of flood action in building up the delta is shown in the accompanying section of a trial boring made in August, 1907, at Ibicuy port, in which the sequence from black alluvium to sand and shells is thrice repeated. The rate of deposition is more difficult to determine, being affected by local conditions at various points in the delta. Twenty-five miles north of Ibicuy, an old channel, known as the Paranacito valley, runs right across the delta. Its former full waters are now restricted to a sluggish drain 200 feet wide, which exactly bisects the valley. The floor of this valley, which averages 12 miles across, is only 11 feet above sea-level, but it is so protected by barrier sandbeds from ordinary floods on the Paraná that its pastures have a grazing value for cattle of £20,000 per square league. In August, 1905, however, the big flood topped this barrier, and the valley, at the point now crossed by the Entre Rios railway, was flooded 8 to 10 feet



SECTION OF BORING MADE AT IBICUY PORT, PARANÁ DELTA, AUGUST, 1907.

deep, resembling a view of the English channel from Dover on a rough day. Flood water remained in the valley four months after the Paraná had fallen, and only finally disappeared by evaporation, leaving a prodigious growth of rushes and rank grass, which, as they rotted under the summer sun, sensibly raised its base-level. By data gathered from old residents, giving a diminished depth in certain swamps and passes below the fixed shore-line of sandhills already mentioned, I estimated that the floor of the Paranacito valley has after this fashion risen 2 feet in the last twenty-eight years. The surface height of the boring taken at Ibicuy port is almost identical, *i.e.* 11 feet above sea-level; but being unprotected by shore deposits, this spot has been exposed to annual, not periodic, flooding from the main channel, and the rate of upbuilding has presumedly been by so much more rapid in proportion.

The Paraná and the Uruguay together, as they flow past Buenos Aires in normal water, have a slightly less volume, and also carry a lesser density of silt, than the Mississippi opposite New Orleans; but for three months of the year, when these rivers are in flood and consequently hold the maximum amount in suspension, their volume is double that of the former. The total deposit in the Plate estuary is therefore certainly not less than that of the North American river, which is calculated to bring down a cubic mile of silt in twenty-two years, and of this total the Paraná alone claims three-fourths. This noteworthy addition to Argentine soil is mostly deposited along the western shore of the Plate, and the rapid advance of the delta down this side of the estuary would, save for the agency of man, shortly convert Buenos Aires port into a land-locked harbour. As it is, the dredging charges entailed by a yearly increasing mass of deposit are largely responsible for the recent rapid growth of Bahia Blanca and the transfer of many railroad termini to that ocean-free harbour.

The verdict of Mr. Corthell, a well-known Mississippi engineer who was employed by the Argentine Government from 1900 to 1903 to study its northern river system, has been since confirmed by the experience of the permanent commissions he inaugurated. It was his opinion that the Paraná should be carefully charted and followed in the varying channels it scoured; that in these it might be guided, but never checked; and that its major floods, fed by tropic rain and snow, were beyond the present power of man to control. In truth, the Paraná plays with islands and sandbanks as a lesser stream with pebbles. A schooner, which sunk nine years ago, off La Paz port (Entre Rios), swiftly developed at its tail an island a mile long, now crowned by willows, which has converted the shore channel on which the town was founded into a *cul-de-sac*. My photograph of the old port of Paraná town in 1902 shows an island 880 yards long by 490 feet wide fronting it; in December, 1907, only 165 feet of the island remained. In direct consequence of the growth and subsequent wasting of this island, the railway mole,

2½ miles down-stream, built eighteen years ago for 26 feet of water, gave only 14 feet ten years later; to-day it admits of 21 feet, and may soon be altogether clear. Similar examples might be multiplied. Guidance of the stream is only possible at cut-offs; never in bends or backwaters. Thirty years ago a market gardener made a shallow ditch opposite Ibicuy river (lower Paraná) to take his produce by canoe from the Guazú to the Palmas channel. The Paraná elected to take his work in hand, and now ocean steamers pass through the "Canal del Mercader" on their way down from Rosario.

Disastrous experience in Government port work at Concordia, Santa Fé, Paraná, and other up-river towns has shown that numerous breakwaters and landing-stages are safer than costly isolated ports; open piers and moles are less liable to occasion current bedding than solid masonry; while floating pontoon stages may be a useful auxiliary to fixed piers. The new port at Rosario is admittedly no improvement on the old system of delivering wheat by shoots from the barrancas down to vessels moored to wooden stages in deep channel. In a word, the means of access from shore to river are most permanently effective when capable of adaptation to the shifting character of the stream. In crossing the swampy backwaters on the Chaco side of the river, it is better policy to build a low, firm road, well protected by piling and ballast, which, though disappearing under highest flood, can be guaranteed to reappear afterwards, than to waste money in constructing high earth-banks, which will be washed away unless provided with flood openings of disproportionate extent.

Fixed pier-bridges across any portion of the Paraguay, the Alto Paraná, or the lower Paraná rivers, even if satisfactory foundations could be found, are financially impossible in the present backward state of the regions served. It must, moreover, be kept in mind that over large sections of its course the Paraná is a frontier boundary and an international highway between Brazil, Paraguay, Bolivia, and Argentina. No permanent structure could be permitted athwart the river which might be utilized to prevent the vessels of Brazil, for instance, from seeking this road to Matto Grosso, or bar an all-water route to the ocean for the products of Paraguay. The train-ferry system inaugurated across the delta from Entre Rios to Santa Fé offers a practical and happy solution to continued rail service through the inter-riverine states and provinces, being sufficiently flexible to adjust itself not only to vagaries of the great river which it oversteps, but also to the political susceptibilities of the republics concerned.

The state of Saõ Paulo (Brazil) has fixed by triangulation that portion of the Alto Paraná which forms its western boundary, namely, from the Paranapanema tributary up-stream to where its headwaters the Rio Grande and Paranahyba meet in 20° S. lat. During the last seven years the Argentine Ministry of Public Works has also

undertaken the mapping of the Plate estuary, the Uruguay river up to Concordia, and the whole of the lower Paraná as far as the town of Corrientes. Outside the portions of the river just mentioned there exists not even the approximation to any public chart fit for use. Starting from Corrientes up-river either to Asuncion or Posadas, the whole shipping trade is dependent on a couple of dozen irresponsible local pilots, engaged by competing firms. In consequence, during my last visit up-river in 1906, I found Posadas, which controls a 300-mile trade zone, and supplies 10,000 labourers to the forests, struggling with a shortage of flour; a month previously the whole town had run out of salt. Under such conditions the wonder is, not that these interior waterways are so little used, but rather that so many traders have the courage to tempt fortune by them. The Argentine commission is charged with the buoying and dredging of mapped and approved channels; it also reports on and authorizes expenditure for river improvements, but its most useful work, apart from actual survey, consists in the weekly report and forecast of the depth of water in various passes, taken from gauges set to a determined zero at controlling points and connected by telegraph. In addition to assisting the passage of ordinary river shipping, stockbreeders in the lower islands and "rincones" are thus warned of approaching floods.

SCALE OF DISTANCES, MEAN HEIGHTS, AND HIGHEST FLOOD-LEVELS ON RIVER PARANÁ.

	Distance from Buenos Aires in miles.	Mean height of river above sea-level.		Highest point above mean level reached by flood of 1905.		Section of river.
		Metres.	Equiv. in feet (Eng.).	Metres.	Equiv. in English feet.	
Buenos Aires (Riachuelo port)	*0·00	*0·00	0	*3·0	9·8	River Plate estuary.
Boca del Guazú (Delta)	*76	*0·42	1·4	no data		
San Pedro	*174	*1·50	4·9	3·5	11·5	
Rosario (Paso Alvear) ...	*252	—	—	*3·0	9·8	Lower Paraná river.
Paraná town (Bajada Grande)	*368	*9·20	30·2	*3·5	11·5	
Corrientes (3 Bocas) ...	*742	*41·79	137·0	*5·5	18	
Asuncion	932	62·00	203·0	3·5	11·5	River Paraguay.
Posadas	975	70·00	230·0	*7·0	22·9	
River Iguazú (mouth of)	1175	98	321	*45·0	147·6	
River San Francisco (limit of navigation below Guayrá fall)	1338	112	367	*48·0	157·4	
Guayrá lake (above falls)	1298	222	728	5	16·4	
River Irahy (mouth of)	1368	230	754			
River Paranapanema (mouth of)	1448	*240	787	No flood data to hand, but probably varying from 5m. to 10m. above mean height of water, according to width of rivers.		Alto Paraná river.
River Aguapey "	1602	*265	869			
River Tiete "	1637	*271	889			
Uberaponga falls (below)	1640	*274	898			
" " (above)	1693	*286	938			
River Grande (Confluencia Paranahyba)	1700	*301	986			

* Points marked with asterisk are taken from official figures of Brazilian and Argentine Surveys.

The superiority of rail over water-borne traffic on a stream so uncertain as the lower Paraná, has encouraged a rival transport system along its banks, which to some degree excuses the long neglect of Government in studying the river itself. Railhead reached Corrientes town twenty years ago, and on the opposite Chaco shore it will shortly touch the south banks of the Bermejo tributary. In another three years link lines in lower Misiones and Paraguay will give Buenos Aires direct rail communication with Asuncion *viâ* Posadas. These two last-named towns constitute each a natural terminus to railroad extension northwards, Ascunsion as the last great centre of population in the open Paraguay valley, Posadas because it is the base of all water-borne trade descending from the forest-clad Alto Paraná. Any step along these rival valleys leads into a practically unpopulated wilderness, where fresh advance can only be made under the impulse of a definite policy. Such advance, to be successful, must be made with a clear understanding of the economic factors which control either region. Let us briefly consider them.

The lands which lie at the back of the southern seaboard of Brazil are reputed to be rich. Actually they are poor, in the sense that a mine may be poor which costs more to work than its ore is worth. Between the ports of Rio Grande and Rio de Janeiro, a distance of close on 1000 miles, there are only two routes by which it is possible to attain the mountain plateau from the coast flats. The first is by the Paranaguá-Curytiba railway, which has been built up on the export of yerba mate from Paraná state; the second, higher up the coast, is the Santos-Saõ Paulo line, which handles two-thirds of the world's coffee. The former is an ordinary railroad built to exceptional curves and gradients; the latter is operated up the plateau face by cable. Both were constructed at enormous cost and exact correspondingly high tariffs. From this toll there is no escape, for they are the bottle-necks through which all produce from the interior must pass if it would find an open market. Back of these short trunks the railroads have expanded into branch lines, but the tendency is rather to parallel the coast than extend into the interior, the more so that proximity to the Atlantic shore does not, by reason of its inaccessible character, substitute a short for a long haul. The branches which run back into the interior, although they tap a richer zone, do so at the cost of a disproportionate amount of uphill haulage, since they work out full loads of produce against the main drainage slope of the plateau. Nor is there any compensation for this steady climb, for by the time they sight ocean the drop to the coast is so short and steep that trains lower themselves cautiously down to port at an increase rather than with a diminution of working expenses. The avowed railroad policy of the Brazilian Federal Government in the south coincides here with the tendency of the individual lines. At present there is rail

communication between Rio de Janeiro and Saõ Paulo city, but southward a gap comes between this system and the lines in the state of Paraná. Santa Katarina has no railways, save the short Maria Christina line, built under guarantee to work some unprofitable coal deposits on the coast, and so the extensive mileage in Rio Grande is again isolated from its fellow states, though shortly it will be linked up with the neighbouring republic of Uruguay. By joining up all the systems strung along its southern coast-line, the Brazilian Government would not only knit to itself in closer bonds these progressive but somewhat restless states; it would ensure at a very moderate outlay, practically continuous rail communication between the capitals of Rio de Janeiro, Montevideo, Buenos Aires, and in a very few years Valparaiso as well.

While wisely urging railroad construction along its seaboard, the Brazilian Government have by no means lost sight of the necessity for establishing better communication between the far interior and the Brazilian coast. By the present route round Montevideo and up the Paraguay river it takes from five to six weeks to reach Cuyabá, the capital of Matto Grosso, from Rio de Janeiro. So long as thirty years ago a survey, under a concession granted to the Viscount de Mauá, was made for a metre-gauge line from Curytiba, situated on the coast plateau and capital of Paraná state, to Miranda, a small township of western Matto Grosso overlooking the Paraguay valley. The report thus describes the general appearance of the ground traversed: "From Curytiba (westward) for 200 kilometres [123 miles] the line crosses highlands with pinebelts. From Miranda east for 300 kilometres [186 miles] the ground is open with belts of forest. In the intermediate zone of 1100 kilometres [684 miles] there is dense virgin forest. . . ." The railroad survey consisted of two sections—the first section crossing the coast plateau from Curytiba down to the Paraná valley, while the second bridged the Matto Grosso water-parting. The route between these respective sections was to be linked up by utilizing the navigable reaches of the Ivahy and Ivaheima rivers, which enter the Alto Paraná from east and west about 62 miles above the Guayrá falls. Using freely 2½ per cent. gradients and curves of 328-feet radius, the estimated cost per kilometre worked out at over £11,000, or say £18,000 per mile. The section submitted shows the formidable nature of the ground traversed, and is an interesting cross-cut of the western half of the continent and the upper Paraná basin at this point (see map).

If the project of a railway from the Brazilian coast across to the upper Paraná and Paraguay valleys is ever realized, it will now probably form a prolongation of the existing system in Saõ Paulo state, which has already advanced some distance into the interior, and, moreover, offers a shorter route from Rio *viâ* the capitals of Goyaz and Matto Grosso. Whatever route is chosen, however, any trans-continental line which crosses the watershed of the Alto Paraná from east

to west must reckon with the southward drain exerted by the navigable waters of the upper basin. Between Guayrá and Uberaponga falls the following tributaries of the Alto Paraná are navigable for vessels of 3-feet draught all the year round :—

Piquiry	93	miles.
Paranapanema and Tibagy	186	„
Ivahy	44	„
Ivaheima and Brillhante	280	„
Pardo	310	„
Total 3-feet draught ...	913	„

Adding that the Alto Paraná, from Guayrá lake to mouth of Tiete, is available all the year for 6-feet draught, we have an extra 335 miles, making a sum total navigable in this upper basin for vessels of 3 feet (and also available for log-rafting, etc.) of no less than 1250 miles.* It would only be necessary to build a short loop line of 31 miles round the Guayrá cataracts, and the whole forestal wealth of the region served by these rivers would come south, water-borne, to its proper and natural market in Buenos Aires, draining traffic from any line crossing the watershed from east to west as inevitably as water drains out of an open gap in a high-level canal. Much as the transcontinental Brazilian line is to be desired, therefore, its construction at present would be strategic rather than economic, and the high cost of such construction will probably oblige it to wait till the more pressing needs of the rich and populated seaboard are first served.

Since the northern lands of the Paraná and Paraguay basin are thus not likely, in the immediate future, to find an outlet to the sea from west to east, any railroad constructed to tap them must inevitably advance from the south. From an engineering point of view, there can be no doubt as to which is the most feasible route. In addition to direct competition with a deep and navigable river over long stretches, any railway adventuring north directly up the Alto Paraná valley would have to be pushed over an incredible jumble of broken hill-spurs and lateral streams descending at right angles to its course, in addition to competing with the river itself over long navigable reaches with a deep, swift current. The valley of the Paraguay river, on the other hand, is open ; its main tributaries join it at fairly long intervals, and floods in the river valley can be largely avoided by keeping to the raised shelf which receives the first drainage from the central Paraguay and Matto Grosso hills. But as, in the long run, problems of engineering construction are subordinate to the proper development of the region they serve, so when considering the relative merits of railroads in the

* This estimate could be largely increased if portage were made round the rapids which obstruct up-river reaches of these and other tributaries.

Alto Paraná or Paraguay valleys, we have to look beyond the immediately realizable resources of the country, to its ultimate settlement by colonization. It is the coffee plantations, and not its mines or its rubber, which form the true wealth of Brazil; stock-farmers will be flourishing in the Argentine Chaco long years after its hard-woods are but a memory. The real point at issue, therefore, is not whether it will pay best now for a railroad to speculate on timber from the Alto Paraná or in cattle from the Paraguay valley, but rather which of these two zones will ultimately afford to the colonist, as distinct from the trader, the best means of earning his livelihood and raising a healthy family. It is essential that railroads should run into the north ahead of the colonist, but its location upon plain, valley, high savannah, or open forest, should be examined from the colonist's humble standpoint, since he it is who must ultimately bear the burden of upkeep.

Stress has thus far been laid on the necessity for railroad construction in opening up the Paraná country, because by the testimony of three hundred years of inaction its needs are proved to have been insufficiently served by the great waterways alone. The first essential in the settling of new districts is a punctual, even if it be a slow and infrequent, service along a known fixed route; instant, *i.e.* telegraphic, information on matters affecting the region and its products; and the assurance of a measure of political favour, or at least impartiality. These factors are of the essence of any railroad construction in South America. They are always difficult, often impossible, to any transport service operating by the Paraná river.

If we accept expansion as the true test of success in settlement, then it must be admitted at once that colonization in the back blocks of the Paraná forests has proved a failure. There are about 200,000 foreign colonists settled in the Brazilian state of Paraná; Poles, Italians, Austrians, and Germans, dating their residence thirty years back, before the days of the Republic. Some 50,000 of these folk are entombed, so to speak, in the pine forests back of the coast plateau. Their contact with strangers is rare, the value of their produce is eaten up by cost of transport, and, after all these years, they represent only a nominal, or at best a potential, asset to the state and country of their adoption. The Italian holdings are slightly better cultivated than those of the Poles or Austrians; but apparently the failure is not due to state or nationality. In 1893 a party of 700 native-born Australians took up land in the forests of northern Paraguay. In these new surroundings they deteriorated to such an extent that in 1905 the remnants of the original settlers, with their few descendants, attracted the serious attention of the South American Mission, whose ordinary field of work lies among the Indian aborigines of the Chaco. In the tropic forest a man's moral and mental horizon appears to shrink in direct proportion to the range of his physical vision. No aborigines yet

discovered, not even the canoe-dwellers round Cape Horn, or the black fellows of Australia, have sunk to the brutish degradation of the Bootcudo club Indians, who smash their trails through the bamboo-smothered forests at the back of Paraná and Saõ Paulo states. In spite of the apparently easy livelihood it offers to those who settle in its depths, the over-luxuriant vegetation of the Paraná forest constitutes in itself the most serious obstacle to the colonists' success.

Other conditions being equal, the taking up of areas of open ground advances automatically ahead of the forest by reason of the larger tracts which can be handled by the individual settler. An energetic man, with the aid of a growing family, can run a 2000-acre stock farm or a 200-acre wheatfield on the Buenos Aires pampas; but to weed a 10-acre coffee patch in Brazil will fully occupy his time, without counting preliminary clearing. Apart, moreover, from the wider mobility and consequent mental stimulus afforded by open spaces, the settler on the prairie has an immense advantage over the forest-colonist in his possession of live stock. The cow ranks ahead even of the plough as an aid to pioneer settlement. Stock can be moved forward at small expense; their value is realizable piecemeal, and at all seasons; they will walk themselves to market where a bag of wheat or coffee will rot on the ground for lack of transport. Live stock not only aids the farmer, but its presence is an infallible barometer to the suitability of any given district for occupation. Just as miners lower an open lamp to prove fire-damp, knowing that where it burns clear the passage is safe, so wherever cattle are known to breed and thrive upon natural pasturage in tropic South America, the settler may safely follow; if they will not, he had better for the present locate himself and his family elsewhere.

Midway between the open flats of the Paraguay river and the forest valleys of the Alto Paraná we come upon the region of upland savannahs. These commence in isolated patches upon the hills of central Paraguay, widening as they run northward along the Maracayu range and the Serra S. Geronimo to Cuyabá, beyond which point they merge with the desert sandstone plateau of Matto Grosso to form the highland centre of the South American continent. The rough pampa grass which covers the upland is mixed with dwarf palms, whose leaves spring direct from the earth, like open fans set to catch a wandering breath of air. At intervals, and especially near the edge of some water-pan, the wayfarer stumbles over thousands of ant-hills, set about with bracken and compact by tiny mandibles to a cement-like hardness. Near the side-slopes of the plateau, narrow bogs denote the presence of springs, developing later into trickling streams, whose deep-worn banks show to what extent they are taxed by the sudden thundershowers. The coarse upland pasture affords, during the major portion of the year, a sufficient living for hardy stock; during the summer months they

descend to eat the young tussock-grass and floating gramminæ of the lush lowlands, which act both as a tonic and a necessary aperient. If such alternation is impossible, salt must be fed in spring to upland stock to secure the proper increase. The import of salt is thus a very serious item throughout the red-earth country of south-eastern Brazil, Paraguay, and Matto Grosso. Grass-land here, where it is wanting, is called "campos saleros," and the lowlands "campos dulces," or sweet pastures, a reversal of the interpretation a stranger would place on the terms. Cattle in the Matto Grosso are largely mixed with the "zebu" breed, which is a direct descendant of the Indian buffalo, probably imported by early Portuguese settlers on the coast. They are also numerous in Minas Geraes. It is claimed for this breed that it is immune to the tick-induced Texas fever, which scourges all the riverine region down to the Plate. Equine stock, from Corrientes to Cuyabá and also in the Paraguayan Chaco, suffer from "mal de cadera," a disease resulting in paralysis of the spinal cord at a point just above the kidneys. The origin of this disease has not yet been discovered, but, being less prevalent on high than on low swampy land, it is probably associated with an impure supply of drinking-water. It is a serious impediment to travel throughout all the region affected, and the Paraguayan Government offers a large standing reward for an effective remedy.

The unoccupied savannahs and grazing-grounds lying within Matto Grosso and Goyaz alone cover an area larger than the state of Texas, and are of at least equal fertility. This district forms the final resort wherein will be raised the rough stock necessary to supply the jerked beef and meat extract factories which at present cluster round the lower reaches of the Paraná delta at Paysandu, Freybentos, Colon, and many other minor points. The frozen meat trade can pay prices for good stock which are beyond the reach of the older industry, whose centres of collection are gradually moving further north. The value of northern grazing lands has gone up in sympathy with the recent rise in the price of cattle, and areas outside the Argentine Republic are now affected by the operation of freezers near Buenos Aires. In 1906 I met a constant stream of squatters from Rio Grande do Sul passing northward *viá* lower Misiones and Paraguay. They were driving troops of mares, mules, and horses, and carried their household goods and women. An estanciero near Posadas informed me that they passed his house at the rate of 200 per month. Being questioned, all these folk had the same answer, that where they came from the owners no longer tolerated squatters, so they were going to Matto Grosso, where land was cheap and there were cattle for everybody. Thus one effect of introducing cold storage into Buenos Aires shipping has been to set up a new current of colonization from the coast toward central Brazil—an interesting side light on the complex causes which govern social

migration. These sandy upland savannahs offer even more favourable conditions to mobility than the low plains, owing to the general absence of flood area on their surface, and such continental trading-routes as to-day exist take advantage of the fact to follow on or near their water-parting.

Thus by earlier occupation, by the superior activity, health, and intelligence of their settlers, by the aid of live stock, and by the facilities they offer for railroad construction, settlement in the lowlands and savannahs overlooking the river Paraguay seems destined to outstrip colonization in the broken and forest-covered areas of the Alto Paraná. This conclusion is the more logical, since the advance development

ARGENTINE CHACO: WORKING OUT THE QUEBRACHO FOREST.

of prairie ground naturally opens up a market for forest products. The first sales of quebracho lumber from the Argentine Chaco were made to the railroads crossing the southern pampas, which now take 2,000,000 hard-wood sleepers yearly, while farmers absorb fence-posts uncountable. So speedy a result could not be hoped for in working out the mixed hard-wood forests in the north, but the earlier settlement of pampa land adjacent to forest, be it in a large or small degree, tends to utilize valuable woods which would otherwise be burnt, and so compensates at least a portion of the fruitless labour which the forest settler must necessarily spend in clearing his patch. Given efficient transport, the most suitable lands for colonization are those located along the fringe where the forest ends and the plains begin. Thus the ancient Jesuit

missions, when they abandoned the forest-enclosed basin above Guayrá for the lowlands of Misiones, increased their numbers fivefold. The site of these old missions, whose memories linger in the names of Apostoles, Sant Ana, San Ignacio, and many others, is now witnessing a new and equally successful colonization. Since 1902 over 9000 Russians and Poles have settled at Apostoles, on the foothills near Posadas, and a deputation of Finns have just arranged for 3000 countrymen to come as their neighbours during the present year.

It is idle, however, to talk of any real development of the enormous areas included in the basins of the Paraguay and the Paraná watershed until some solution is arrived at as to the source of the labour supply necessary for so gigantic a task. German, English, Polish, and Italian immigration has been tried in turn in Brazil with indifferent success, if not positive failure. Argentina now absorbs almost all European immigration to South America; but of the less than 300,000 immigrants who reach her shores annually, over one-third return to their native Spain and Italy after harvest. Of the 200,000 remaining the majority are attracted by conditions of trade, climate, and soil to the lands near Buenos Aires and the undeveloped plains lying west and south of Bahia Blanca, including Patagonia. But even so, barely 2,000,000 people to-day occupy this southern area, of a fertility capable of supporting ten times that number. It will be long, therefore, before the overflow of Argentine immigration extends northward; indeed, the tendency at present is all the other way, and in Posadas it is found yearly harder to secure the 8000 to 10,000 labourers necessary to handle the yerba and lumber trade of the Alto Paraná, where a man's wage is reckoned by well-paid piecework. In Paraguay itself and adjacent territories the real difficulty lies, not so much in lack of population, as in the combination of a bountiful soil with a low standard of living, which deprives the native of any incentive to prolonged labour. If this be the case within the comparatively populated zone of the Paraná watershed, how shall the waiting lands further north be reclaimed? Lacking outside help, the vast areas of the Paraná and Paraguay basins will remain as to-day—explored and, where possible, exploited by traders. They cannot be properly colonized within the limits of the present century.

The only solution to the speedy settlement of central South America lies in the introduction of the semi-Slav and Asiatic populations overflowing the Near and Far East. Even if we reserve from this class of immigration the open and pastoral districts as more suited to the genius of the South American mestizo, we are still confronted with the task of developing the great wooded areas. To overcome the deadly inertia induced by the steaming tropic forest, to resist its insect hordes and their attendant diseases, to fight back the inroads of its crowding vegetation, there is necessary a counter-force of humanity, directed

not in spurts and dribblets, but in a steady and well-supported flow. For this gigantic task the scant supply of settlers from purely European, much less local, sources has already proved itself—and will always prove—entirely ineffectual.

If Asiatic immigrants are properly selected and settled, the Republics involved are not likely to object. The Argentine immigration office already receives in increasing numbers Croats, Armenians, Turks, Russians, and unrecognizable mixtures from the Balkan states and Asia Minor. Hundreds of these folk were forwarded from Buenos Aires for work on the Entre Rios railway in 1907, and proved, in the majority, young, healthy, and hard-working folk. At present they land in insufficient numbers to sensibly affect the immigration returns, although the uncomplaining victims claimed during a single year in the East by famine, flood, and pestilence would populate a whole tropic state of South America. The adaptability of the Chinese or Japanese colonist to South American soil need cause little anxiety. The aboriginal tribes of the continent, especially upon the Andean slopes, show so marked a facial likeness to the so-called "Mongol" type that theorists have already been led thereby to attribute the original peopling of South America to direct Asiatic migration in the past. Lacking definite proof, the resemblance is more naturally explained as a simple physical coincidence, evolving on similar lines under two different environments. The transplanting of the Asiatic to the unoccupied hinterlands of central South America would solve a vexed problem, fraught with grave danger elsewhere, but only with benefit here. It would not only leave unharmed the existing scant Indian population, to which it is already superior both in intelligence and stamina, but even reinforce the aboriginal and self-adapted type. Within the Paraná basin—we need not yet include the vast Amazon valley—there is room and to spare for all for many years to come.

The vast scale on which the main physical features of the region under review are planned have influenced its past development along well-defined economic lines, which not all the resources of a newer civilization can override. The trunk-lines of advance still lie upon, or parallel to, the continental water-partings. Present-day republics on the Pacific slope centre along the old Inca road, running between the crests of the Andes. The railroads of the Atlantic sea-front are being welded into a continuous system along the coast plateau, where the footsteps of the pioneer Portuguese halted. The cost of a trans-continental railway (say from Rio de Janeiro to Iquiqui, in northern Chili) would be practically prohibitive, even if strong commercial or political urgency justified its construction. No such necessity exists. The trans-continental lines in Canada and the United States offer no real analogy to the position here. The Pacific and Atlantic seaboards of South America are held by separate nations, between whom exists a sentimental

tie, but little real community of interest. There is a minimum of commercial interchange from shore to shore, and of the area between it is safe to say that there is scarcely a single product, raised along the tropic parallels of latitude which transect the Paraná watershed, which could bear an east-and-west freight in competition with the easier outlet south to the Plate estuary.

Now at last in our day progress is being made in the great neglected central zone watered by the Paraná, and here, as has been shown, the main line of advance will still be south and north. For if we accept the statement that mountains are the true frontiers of nations, then the reverse also holds true, and the valleys that connect them are their best and natural highways. So, when the railroads which already link Patagonia to Paraguay extend further along the great "llanos" overshadowed by the Andes, right up to a navigable port on the Amazon, they will strengthen, better than any words or treaties, the ties of rational trade and intercourse between the republics whose hinterlands meet in the Paraná watershed.

Economic forces are already working in either region to join hands. The Madeira falls railway, in construction to join the upper and lower Amazon valley, the railroads heading north through the Chaco forest, the Entre Rios train-ferry and other branch lines linking Buenos Aires to Asuncion,—all obey the same inevitable tendency. The 15,000 miles of railroads serving the temperate prairies of Argentina will in time be brought into touch with 30,000 miles of navigable waterways which ramify through the tropic Amazon valley. But the economic conquest of the Paraná watershed will not be brought about by strategic sallies down the bleak Andean plateaux or across from the scarped coast-line of Brazil; rather by progress, slow but sure, from the broad base of its delta, along the open pampas which lead the great river into the very heart of the continent.

The PRESIDENT (before the paper): Mr. Barclay, the reader of the paper to-night, has been connected with South America in one region or another for a considerable number of years. Five years ago he contributed to our *Journal* an extremely interesting paper on the Land of the Magellanes and on the Ona and various Indian tribes bordering on the Straits of Magellan. The region with which he deals to-night is exceptionally interesting, whether we regard it from a hydrographical, geographical, racial, or an economic point of view. As Mr. Barclay has a good deal to say, and as I hope there are a considerable number here present who from their special knowledge of this part of the world will take part in the discussion, I will do no more than call on Mr. Barclay to be kind enough to read his paper.

The PRESIDENT (after the paper): In opening the discussion to-night on this very interesting paper, I know that there are a number here present who are well acquainted with this district, and who will have much which is of interest to say, but I am quite sure I am speaking in the name of every one here present when I say that there is one voice above all others which we wish to listen to first to-night,

and that is the voice of our late honoured President, Sir Clements Markham. We are delighted to see him again at our evening meetings, and that is reason enough for calling on him first, even if he were not one of the greatest authorities on the geography of South America. I hope he will say a few words.

Sir CLEMENTS MARKHAM: I am sure we have all listened with great interest to this admirable paper on the great river Paraná. There are many points that have probably struck most of the audience in the paper, which I had the pleasure of reading before I came here, and one which struck me perhaps most was Mr. Barclay's reference to the continuity of the flats between the headwaters of the Paraguay and the headwaters of the Amazon. The grandest features of South America are the magnificent Cordilleras of the Andes, but almost as grand are its great river-basins, unequalled in any other part of the world, and when the time comes, and it will probably come, when those two great river systems of the Amazon and the La Plata are connected, there will be a highway along almost the whole length of the centre of South America, with a constant ebb and flow of commerce over its hundreds of navigable channels. We must, however, remember, as Mr. Barclay has reminded us, that the power of nature is greater than the power of man, and that when the great floods come down with their rains and snows from the mountains, there is no power of man that can check them. If I remember rightly, Mr. Barclay said, "No *present* power of man can control them," by which I suppose, he means that he looks forward to a future time when man will be able to control these tremendous floods; I hope it may be so. The other point of great interest in Mr. Barclay's paper is the vast region in this part of the world which is suitable for colonization of various races. I think he said that in Matto Grosso and Goyaz alone there were unoccupied savannahs and pastures covering a greater area than the whole of the state of Texas, and quite as fertile. I think it must be clear to us all that there is a great future before this Republic of Argentina. We have had descriptions of its rivers before now in this hall. I would refer first and foremost to the greatest of South American geographers, our old friend and colleague, Francisco Moreno; then there was Don Ramon Lista, who also explored that territory of the Misiones which was the subject of a very interesting part of Mr. Barclay's paper. I remember, also, those great navigators, the Pages, father and son, who described to us, with a long interval of time between them, the headwaters of the Paraguay and the lower reaches of the Paraná. We have heard all these papers in this room, but on the whole I must say that I think Mr. Barclay's paper was as detailed, as interesting, and as informing as most of the others. We admire the splendid work of our Argentine colleagues, and I am quite sure that they will heartily join with us in our appreciation of this excellent paper by Mr. Barclay.

Mr. FOLLETT HOLT: Being closely connected with South America, I am only one of many who will hail this important paper from Mr. Barclay with much pleasure. It is very rarely indeed one hears in London any reference to the physical features of South America. I spend several months in each year in England, and frequently am asked as to the progress of this or that enterprise, but never is any curiosity shown as to the economic or political development of the South American countries or races, although they are becoming, as we know, a factor to be reckoned with in the world's equation. In his paper, Mr. Barclay mentions incidentally that the opening up of the centre part of the continent must come from the valley district of the Paraná. This is not in agreement with the ideas of the North Americans, who have interested themselves of recent years in the proposed Pan-American railway, which must in the future link up the Americas with a through road of standard gauge from north to south. They profess to adhere to a

project for joining up and extending the meandering lines of varying gauge that exist on the slopes of the Andes, and thus to unite the north with the south. In my opinion that line would be of little practical use for the high mission in view, of mixed gauges carved through the Andean range, it would, in fact, be but a costly parallel to the coast route of the Pacific ocean. The line required must be of international gauge, and in its route from Panamá to Buenos Aires must bisect the immense continent to take to its very heart for the benefit of the world the administration, control, and population already enjoyed by the settlements on its Pacific and Atlantic coast-line. With this in view during the last few years a few railroad men have been forcing a railway of the 4 feet 8½ inches gauge from Buenos Aires, the metropolis of the south through to the centre of Paraguay. The line, having passed from the Argentine to the republic of Paraguay, has now to pass on to Brazil, and through from Brazil to Colombia and Panamá. There is, however, unfortunately, the same lack of brotherly love between nations in America as there is in Europe; the railroads cannot do more for the time than they have done, and if the exploration now necessary to guide us to the route we should champion is left to international negotiations, it is improbable that any of us here will live to see a further step forward. I would humbly suggest that here is an opportunity for this great Society. We railway people connected with the Argentine and Paraguay cannot go further than we have gone, and we know even as the railhead must precede the colonist, so must the geographer precede the railhead. We now want his aid in this world's work; the travels of the skilled geographer helped the way from the Cape to Cairo, and his presence is necessary now on another continent. So it is you are face to face with an opportunity of correcting and adding to the much neglected map of South America, and of pointing through the heart of its dark continent the highway which would advance its population, productiveness, and civilization by a hundred years. Under the ægis of the Royal Geographical Society, an expedition with this object, I feel sure, would meet with ready support from the many wealthy and influential South Americans interested in the future of this great continent. The main difficulty that has to be faced is the crossing of the valley and the headwaters of the Amazon, but I think that if we have been able, in our humble way, to cross the delta of the great Paraná river, so, following the footsteps of the geographers, should we be able in good time to find a means of crossing with this railroad we have so much at heart the sources of the mighty Amazon.

Mr. V. Branford: I should like to associate myself with what has been said as to the value of Mr. Barclay's paper, which, as a combination of pure and applied geography, seems to me quite a model. It was really two papers, by the way. I had the pleasure of reading the written paper, which will appear in the *Journal*; but such is his mastery of the subject Mr. Barclay gave a different paper to-night —improvising to suit his lantern-slides. For those who travel in these regions, Mr. Barclay's paper will mark something like an epoch. When we go back, we shall see a new significance in what seemed to us familiar phenomena. As to the details of Mr. Barclay's paper, I will say little more than a single word, and that by way of supplementing what he said as to the cataclysmic character of the floods. I happened to be in the Gran Chaco after the great flood of 1905. I was unable to find the mouth of the Pilcomayo river at the spot it is marked on the maps. It had, in fact, been shifted several miles from its old bed. The significance of this comes home to us if we remember that the Pilcomayo, though only a tributary of a tributary of the Paraná, yet according to European standards might be almost called a first-rate river. The general conclusion from Mr. Barclay's paper, I take it, is this: That the river Plate region is no exception

to the general principle that trade tends to develop in a north-and-south rather than in an east-and-west direction, *i.e.* along lines of longitude rather than along lines of latitude. Colonel Church has given us some important clues to South American geography, and one is glad to have this opportunity of expressing one's deep indebtedness to his writings. The traveller in South America is bewildered by the vastness and variety of his observational data unless he has some guiding principles, and he finds these, to a great extent, in Colonel Church's papers. One of these clues is that the South American continent is relatively backward in its economic development as compared with North America, not because of any differences in the races who have developed it, but because of the geographical fact that the South American continent is walled in by an almost unclimbable chain of mountains, with only four gateways, and one is the river Plate gateway. Mr. Barclay has told us of the means of communication which are pushing up northwards to connect the great central region with its river Plate gateway. Then he has raised the question of future policy, and it is particularly appropriate that that should be raised here in London, because we to some extent have fallen a little behind in respect of our attention to the economic importance of this region. Germany especially is paying attention to the economic importance of this region, and that in a great many ways. I will instance one only. For many years it has been customary to appoint to the Ministry in Buenos Aires a German representative of first-rate ability and experience, and not only that, but Germany has discovered there is such a thing as applied geography. The German Government provides its diplomatic representative with an expert in economic geography. The resources of geographical and economic science are utilized to make serious studies of those regional problems which touch practical affairs. Thus it comes about that the German Government, German traders, and German settlers are equipped, not only with fuller information about the present, but are also more adequately guided in their policy for the future than other peoples interested in this region. I commend Mr. Barclay's paper and its masterly indication of policy to British diplomatists as well as to British financiers and traders.

Colonel CHURCH: The region through which Mr. Barclay has taken us to-night is the most interesting one east of the Andes, but I am not of opinion that it is going to be developed principally by way of the Rio de la Plata. The commercial value of this great estuary depends on its depth of water, which, at most, is sufficient to admit vessels drawing 24 feet. In this era of increasingly heavy draft of ships, the Plata must yield, so far as the valley of the upper Paraná river is concerned, to the deep-water ports facing it on the Atlantic coast. The lecturer thinks that the barrier of the Brazilian coast range of highlands, 2000 to 3000 feet high, will prevent direct railway access with the sea. It is, however, not an important engineering feat to scale the Serra-do-Mar. The best paying railway in South America crosses it to-day, and other lines are under construction by private capital.

Until very recently, no emigrant who landed in Buenos Aires thought of going to Entre Rios or Corrientes, on account of the difficulties of the journey and the length of time required. Now that is changed by the train-ferry across the river Paraná, which puts the great city of Buenos Aires in direct connection by rail with the provinces mentioned, and, soon, it will be possible to take this railway route to the capital of Paraguay. There is a great future for all of this region. Its development has practically just commenced, and the railways controlling the outlets of its vast natural resources are destined to have an immense traffic.

The PRESIDENT: The time is getting on, and it is time to bring this discussion to a close. Before I do so, I should like to ask the lecturer one question on my

own behalf. After reading his very interesting paper, the work which I went to in order to refresh my memory was a book called the 'Voyage of the Beagle.' There I learnt that even in the year 1833, my father was lamenting the slow growth of the population in this same country. He put it down to the want of energy amongst the people of the country. I do not think he altogether recognized the physical difficulties to be met with. He did mention the floods, and also the great drought which had occurred two or three years before he travelled in this land. In Buenos Aires alone a million cattle died. I should like to know from the lecturer whether any such great drought has recurred; and whether droughts of this description have had an effect in stopping migration towards the upper waters of the Paraguay. Before I ask Mr. Barclay to reply, I am quite sure I shall in the name of every one here present thank him very sincerely for his admirable lecture, and for the beautiful slides he has shown us.

Mr. Barclay: In reply to our President's question, I can only say that I went through a bad drought in Uruguay in 1893, which lasted for three years. My neighbours lost about 80 per cent. of all their cattle. One man, out of 2400 cattle, lost all but one cow, and he went and cut her throat, so as to make it a clean job. That was an exceptional drought, but I do not think that in the long run it retarded progress. In the newly fenced southern areas, I think, droughts have sometimes hastened the agricultural evolution of the river Plate country, by killing off large numbers of unprofitable native stock, and obliging people to plough up their ground for wheat. How far droughts have affected the northern interior country, I cannot say. Probably they are not much to blame for its lack of population, for, even in early accounts, there does not seem to have been many more people there than to-day. I will ask Colonel Church to excuse me if I still differ from him. I did not mean to imply that no line would be built from the Brazilian seaboard towards the interior. The Brazilian Government may think a strategic line necessary in order to open up this country. Mr. Holt has hinted at a deadlock in this matter of railroad advance north from the Delta. The stoppage can only be temporary, for the railways will be forced to move as soon as people want to open up the country ahead of them. Meantime, I welcome his suggestion. If his railroad and the other railroads interested were to approach this Society and say, "We will equip an expedition, if you will give us the benefit of your experience as to the best lines on which to run it and whom to send," I am sure such an expedition could not fail to be of interest and benefit. Mr. Holt has referred to the successful bridging of the Delta by rail and train-ferry as affording some small help to the railway advance northwards. That fine undertaking always struck me as being the reverse of small. But I am glad that Mr. Holt takes this view, because then I cannot conceive how there will be any difficulty at all with regard to the still smaller, yet not unimportant, matter of sending an expedition ahead, to find out what is waiting for the railroads in the far interior of the country.

THE DANISH NORTH-EAST GREENLAND EXPEDITION.*

By Lieut. A. TROLLE, R.D.N.

It is a great honour to me to be allowed to give an account of the Danish North-East Greenland Expedition before a Society which numbers among its members so many famous explorers. By a tragical death our leader,

* Read at the Royal Geographical Society, December 7, 1908. Map. p. 116.

Mylius Erichsen, who first conceived the plan of this expedition, has been prevented from seeing the realization of his great idea, as well as from describing himself the way in which it was accomplished.

The object of the expedition was to explore the last of the hitherto unexplored parts of Greenland. The whole of the west coast from 78° N. lat. to Cape Farewell is, as is well known, under the administration of Denmark. On the east coast there is a Danish colony at Angmasalik, while great parts of the coast had been mapped by Captains Holm, Garde, Ryder, and Amdrup. The stretch from 72° to 77° N. lat. had been explored, chiefly by Clavering and Sabine, by the *Germania* Expedition, by the English whaler Scoresby, and the Swedish explorer Nathorst. From 77° N. lat. and farther north the country, however, was practically unexplored, though the Duke of Orleans, on the *Belgica*, in 1905, had gone as far as 78½° N. lat. and from his ship had seen part of the outer islands.

The north-west had chiefly been explored by British and American expeditions, and the chief merit of the *Danmark* expedition is that it has now supplemented what was still wanting in a knowledge of the outlines of Greenland, by exploring the whole of the north-east coast.

The expedition consisted of twenty-eight members, and a characteristic feature of its organization was the unusually large scientific staff and proportionately small crew, in the proper sense of the word. Thus there were six cartographers (under Captain Koch, R.D.I.), two meteorologists, two zoologists, one botanist, one geologist, one hydrographer, one ethnologist, one physician, and two painters, besides one ice-master, two mates (both of whom belonged to the cartographers' staff), two engineers, two stokers, three Eskimo, and only three sailors. The scientific staff, however, had agreed to do the common ship's work besides their own special work, and, upon the whole, this arrangement worked rather satisfactorily.

The expedition left Copenhagen on a beautiful summer's day in June, 1906. After having stopped first at the Faroes, later at Eskefjord, on Iceland, to fill up coal and take additional stores on board, we headed directly for our destination, and in constant fogs passed Jan Mayen. At last we were confronting the question of most vital importance to the success of the expedition: Should we succeed in penetrating the pack-ice dividing us from Greenland; and, in case we did, how far north should we then be able to go? According to all former experience, the best place for pressing through the ice to the east coast of Greenland was somewhere near 74° N. Lat. For the *Danmark*, the ship of the expedition, this point, however, was not northerly enough—our destination was Cape Bismarck—for which reason I thought it safer to steer north in the open water outside the ice, and then bear right across through the ice to our destination. Everything considered, this seemed to answer our purpose better than trying to penetrate north along the

coast, where the water is usually passable, but might very well here and there be blocked up with ice.

On July 31 we saw our first ice, passing along the outer rim of some small hummocks, and on the next day we were at the border of the heavy pack-ice, as well as at the edge of the continental shelf. We knew this because our sounding-lead, which had just shown a depth of 1300 fathoms, now only showed 165. This seems to indicate that the chief branch of the south-going polar current runs across the shoals which are found everywhere outside the east coast of Greenland, but gradually lessons its strength over the deep sea.

The prospects of our penetrating west were not very bright. The ice-master declared that the ice was uncommonly heavy. Everywhere we had heavy icefloes, many feet deep and here and there piled on high, and never one drop of water. For a couple of days and nights I now sailed along, unable to get in. Finally I saw an open lane in the ice. I immediately gave orders to go in, and had some very difficult manœuvring, pushing in between floes of ice the size of which I was sometimes hardly able to realize, even from the look-out station in the crow's-nest, and along lanes which were only just wide enough to allow the ship to pass.

In the beginning we lost much time in fruitless efforts when we had stuck in the ice. We pushed and shoved with long poles, but we soon realized the futility of these efforts, and learned to wait patiently for a change. Changes in the ice very often took place with the changing of the tide, and it is likely that the waves of the tide are apt to influence the relative position of the ice-floes. Thus we fought our way through the ice, one day, in spite of continuous efforts, only advancing a mile or two, the next day perhaps proceeding 10 to 15 miles. Twice we were surrounded by the ice for a period of thirty-six hours, and in the beginning it looked dangerous enough, but the conditions soon became better, and we got through. Our excellent Norwegian ice-master, the experienced Captain Ring, here stood us in good stead.

One day we had all left the ship to try our boats and equipment. By some mistake the door of the cabin had been left open, and the consequences were dreadful. All our hundred dogs had rushed into the saloon and the galley, and when we returned we were met by a scene of the wildest disorder. Although the grate in the galley had been burning hot, the dogs had jumped on to it and had devoured everything they could find—soup, meat, and gravy. Most of them had already finished their meal, and were now making themselves comfortable in the different cabins, where they lay licking their chops, one of them even sleeping peacefully. Of course, they had a sound beating, and were turned out of their new-found Paradise, while we stood there without our dinner, but richer in experience. We had learned to take care to close the doors whenever we left the ship.

SUNSHINE IN THE PACK-ICE

TYPICAL FJORD IN THE INTERIOR OF KING FREDERICK VIII. LAND, LAT. 77° N.

On August 13—we had taken thirteen days for 140 miles—we reached land. It was the most beautiful sunshine, and there, at last, we were sailing in the so-called shore-water, where the ice was very loose. The sea was like a mirror, reflecting the long Koldewey island, with the dazzling whiteness of the inland ice showing glittering from behind the bastion-like rocks.

Mylius Erichsen and some of the naturalists went ashore and built a cairn, where they unfurled the Danish colours. We had reached as far north as we had ever dared to hope, but we tried to go still further in the shore-water. At Isle de France (77½° N. lat.) we were stopped by impenetrable pack-ice, and had to go back, after having landed Captain Koch and several other cartographers, together with some big caches of provisions, at the most northerly point of the continent. The harbour place which we chose was one we had previously found inside the outer range of ice, and thus protected against the heavy pressure of the pack. We anchored the *Danmark*, the bow pointing southward, and with hawsers from the stem to the shore. After that we built some houses ashore, in which the various branches of scientific research were to be carried on, and the latter commenced.

Most of the men were only on board during the intervals between the sledge trips. Even during the dark season the sledges were sent out, and when we had no more dogs the men pulled the sledges themselves. Yet I dare say that we should never have reached our final goal without our excellent Greenland dogs. These dogs were almost as dear to us as our comrades, and we had a name for each of them. In the beginning we had a hundred, but their number was by-and-by greatly increased with numerous puppies. Thus one day a single dog presented us with a litter of seven young ones. For a moment we hardly knew how to find names for all this wealth of puppies, but then one of the sailors offered the really brilliant suggestion that we should name them Sunday, Monday, etc. These dogs required a good deal of food, 150 lbs. a day, and the feeding-time was usually a signal for furious fights. For, timid as the dogs were in their relation to man, they were as cruel in their relation to each other. Of course the strongest had their way, and but for our protection the feebler ones would have been perfectly at their mercy. A sledge team consisted of eight to nine dogs, and the dogs were harnessed Eskimo fashion before the sledges of the common Eskimo type.

In the autumn of 1906 depôts had been established along the coast to 78½° N. lat. The ice was smooth, and the trips were quickly finished. As mentioned above, we also made several trips during the dark season, one to the depôt at Shannon and Bass rock and to Pendulum island, and in February depôts were established farther north.

On March 28, 1907, ten sledges left the ship bound for the long

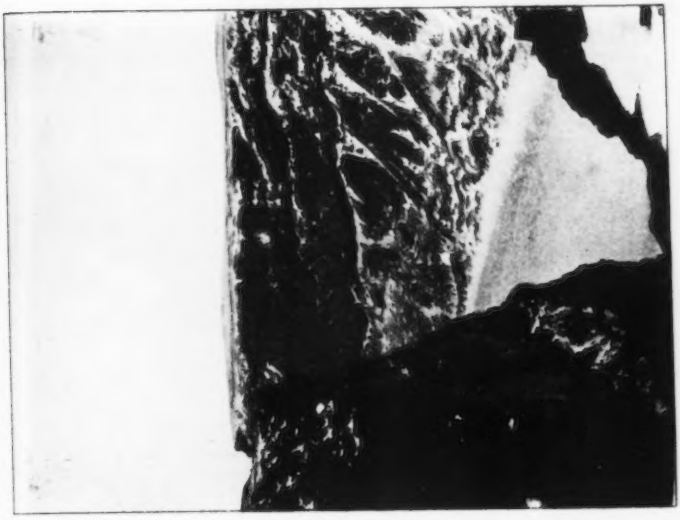
trip. They travelled northward over Jökel bay, where the ice was very difficult to pass. The usual fjord ice was so far passable enough, but here they had to do with the inland ice, running directly into the sea, and everywhere there were cracks and hummocks, which they had to help the sledges over. Having passed Lambert Land, they were, however, again on the fjord ice. In this place they met several bears—mothers with their cubs. As soon as they came within sight, the Eskimo Brönland and Tobias let go everything they had on their sledges, let loose some bear-dogs, and went in pursuit of the bears. The dogs soon caught up with the bears, and nipped the hind legs, while the sledges coming up full speed from behind, sometimes tripped up their heels, so that the bears lost their footing and the men could shoot them at short range.

At the Malemuk mountain the sledges had to stop for one night, waiting for the new ice to form. This beautiful mountain presents an almost perpendicular front to the sea, while the strong currents in the sea frequently cause open water. Here Bistrup and Ring went back to the ship. A few days afterwards Thostrup (second mate) and Wegener, the meteorologist, took their leave, having to map the coast between there and the harbour of the *Danmark*. First division, Mylius Erichsen, Hagen, and Brönlund; and second division, Koch, Berthelsen, and Tobias, continued their northerly course. Contrary to expectation, the coast kept on bending eastward, which, of course, greatly increased the distance, and provisions began to grow scarce. They took counsel, and agreed that they would rather risk their lives endeavouring to reach their destination than return.

The depôt had to be made very small, and thus at last they reached a place where the coast began to bend westward. The second division went north to Peary Land, while the first division went west into Peary channel. They followed the coast of this channel, thus coming into the big Danmark fjord, which was nearly 80 miles deep, all the time believing, as in fact they had reason to believe, that they were in a channel leading up to Cape Glacier. At last they discovered their mistake, and had to go out again. They got some musk-oxen, but far up in the mountains, from where it was impossible to transport them down to the camp.

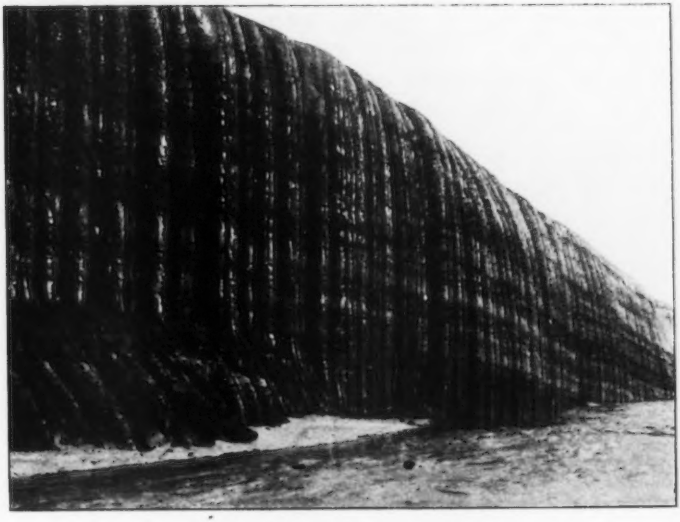
The second division was luckier. They too got musk-oxen, but quite close to the tents, the musk-oxen standing in their usual battle array with the calves in the middle. This lucky incident probably saved the lives of Koch and his companions, for at that period their dogs had been quite worn out with hunger and had hardly been able to pull the sledges. They passed Peary's cairn and continued as far as Cape Bridgeman, the northernmost terminus of Peary Land (83½° N. lat.), where they built a cairn and unfurled the Danish colours.

On May 28 they met the first division at Cape Rigsdagen, in the



FJORD, LAT. 77° N. SUMMER.

INLAND ICE.



EDGE OF THE INLAND ICE, LAT. 77 N.

mouth of the Danmark fjord. But as Mylius Erichsen wanted to continue for a couple of days more in order to explore the still unexplored land to the westward up to Cape Glacier, they soon parted again, and Koch, with his companions, hastened back to the ship. On their way home they had several difficult passages, owing to the large amount of open water along the coast. Thus they had to pass the Malemuk mountain on a very narrow glacier, slanting almost perpendicularly to the open water. They arrived at the harbour of the *Danmark* on June 24, the same day on which the rivers began to run.

Summer had come, and though I began to feel anxious because Mylius Erichsen and his companions had not returned, I could do nothing to help them. As is well known, travelling during the summer time is quite out of the question in a country like Greenland. On land the snow has melted away, in every groove a river is flowing, and at sea the ice is lying still, though it is broken up in cracks and crannies, so that progress by boat or sledge is equally impossible. However, as soon as the autumn ice began to form, Thostrup, the second mate, was sent out with six sledges to rescue Mylius Erichsen and his two companions. The sledges broke through the thin ice, and men and dogs narrowly escaped being drowned. At Jökel bay they had a very difficult passage on the inland ice, where the cracks were not yet covered with snow. Several of the dogs fell down to the bottom of these cracks, two or three hundred feet deep, where their drivers tried to shoot them, but did not always succeed. At last Thostrup reached the Malemuk mountain, but even this time he found open water, and had to return without having seen anything of the missing men. We were very sad at the time that the rescue party had not been able to penetrate further, but afterwards we had only reason to be glad, considering that Mylius Erichsen and his companions had mounted the inland ice on the very same day when the rescue sledges had returned, and that they would thus never have reached him, but perhaps only have perished themselves in their vain efforts.

In November, after the sun had left us, the sledges were back, but the dogs were so feeble that three of them died of sheer exhaustion. Still Thostrup made another splendid trip with them in order to get some dogs' food which we had left at the Shannon depôt. He was absent for about two months, travelling in the heart of the winter, in bad weather, with only the moon and stars to help him to find his way through the hummocky ice. He succeeded in getting the dogs' food, but being delayed by the bad weather he was obliged to use most of it himself, so that on his return I had nevertheless to shoot most of our dogs, as we had no more food to give them. I only kept twenty-eight alive for the last effort to find our three lost comrades.

On March 10, 1908, Koch and Tobias left the ship, bound on that errand. A few days afterwards they found Brönlund's body at the

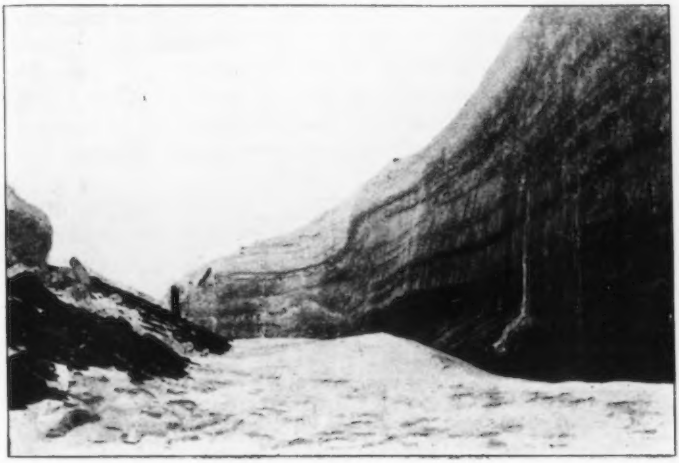
depôt of Lambert Land. I shall later on return to this tragedy, which made so deep an impression upon all our minds.

Apart from the trips mentioned we made many others, the total number amounting to about two hundred. The sledges, drawn by men, were sent into the interior of the country to the fjords and lakes and on to the inland ice, where the going was particularly hard, owing to the roughness of the ice. Its border was in some places quite impassable.

During the summer we had two motor-boats, very handy for the trips in the interior fjords, where the ice generally melts away in August. They stood us in particularly good stead when we were hunting walruses. The average weight of a walrus was 2000 lbs., and we killed them by means of harpoons, as we might fire as many as twenty to thirty shots at them without any visible effect at all. Of other means of locomotion we had an automobile, but its motor was so feeble that it was of no great help to us. It was only used once on the smooth autumn ice of 1907 to draw in some building material for a meteorological station 40 miles from the ship, but on its return it stuck in the snow, and there it still stands.

I avoid referring otherwise than in the most general terms to the results of the scientific work carried out by the specialist investigators, these being published later. My object to-night is only to give you an idea of the land and of nature. The land of King Frederick VIII. is a beautiful mountainous country, in many places very much like Norway —the same picturesque valleys, the same deep fjords, with steep mountains, as high as 2000 feet on both sides, which have inspired our two painters, Fries and Berthelsen, numerous islets and rocks intersected with sounds. Everywhere there were traces of glaciers from the ice-period, but still earlier the country must have had a milder climate. The geologist, Jarner, found impressions of animals and plants from this period in the sandstone of the Malemuk mountain, on Koldewey island, and Hochstetter foreland, and brought a fine collection home.

The country is not very wide. At 77° lat. you will reach the bottom of the interior fjords about 40 to 60 miles from the coast, and here generally a glacier is coming down from the inland ice. Farther north, at Jökel bay, however, the inland ice goes directly into the sea, and the coast-line here consists of two ranges of islets. At the Malemuk mountain there is some more free land, but it is narrower, and becomes lower and lower, until it finally disappears, and the inland ice again goes straight into the sea. Danmark fjord is a big, mountainous fjord, 80 miles deep. Peary Land is not covered with inland ice; its southern coast is very low, and in the interior there are mountains to a height of 2000 feet. All this coast-line up to Cape Bridgeman and most of the edge of the inland ice has been mapped by the cartographers' staff, under Captain Koch, by theodolite measurements in a



EDGE OF THE INLAND ICE, LAT. 77° N.

SUMMER IN NORTH-EAST GREENLAND: WATER RUSHING DOWN TO THE RIVERS, LAT. 77° N.

very exact manner. The country in the neighbourhood of the harbour has been mapped topographically, and the triangulation there is brought in connection with the German triangulation in 1870.

The most interesting geographical feature is the big peninsula going eastward to 12° W. long., so that the outlet between Greenland and Spitsbergen of the great Polar basin thus becomes rather narrow. In this connection I shall just mention that Dr. Nansen, on account of his hydrographical observations in the Polar sea, supposed the existence of a suboceanic ridge between Greenland and Spitsbergen, and as the coast of Greenland here is quite flat, the probability is that such a ridge really exists.

The frontier of the inland ice is in some places quite steep, in other places you might have mounted the inland ice without knowing it. The glaciers are few and not very productive, still the fjords are sometimes quite filled up with icebergs stranded on barriers in the mouths of the fjords.

In the interior, about 40 miles from the edge of the inland ice, we found and mapped out some islands, nunalands, quite surrounded by the inland ice. Strange though it may sound, we here saw flowers and tracks of foxes; also in some places coal. During the winter the land was covered with snow, with only here and there some bare wind-swept spots. In the spring this snow partly evaporated, even with a temperature of 20° Fahr. Then the water began to melt in the ravines, and running under the glaciers, it formed the most fantastic ice-grottoes, where the light was broken into all colours through the crystal-like icicles.

The change into summer was quite sudden. Gradually the temperature of the snow had risen to zero, and then in one day it all melted. The rivers were rushing along, flowers were budding forth, and in the air the butterflies were fluttering. It was a lovely time, bringing hard work for the botanist Lundager and the zoologists Manniche and Johansen. The birds came nearly all on the same day, most of them even at the same hour. One day we had only had the ordinary ptarmigan and the raven; the next we had the sanderling, the ring-plover, the goose, the eider duck, and many others. Young sanderlings, icelandic ring-plovers, and Sabine gulls have been found by Mr. Manniche, our indefatigable ornithologist, and fine specimens are brought home.

Of bigger animals we found bears, musk-oxen, and wolves; foxes on land, and walruses and seals at sea. Bears are rather plentiful; we shot ninety in all, but musk-oxen and wolves are scarce. The five wolves we got were, I believe, all that were there. They were very meagre, and looked as if they had had nothing to eat for a long time. The snow-hares, which we found in great numbers, were very tame in April and May, and we could then go quite close to them. In the sea, the lakes, and the rivers animal life was not abundant. Some polar

cod and inferior animals were usually the results of our net-fishing. In one of the lakes, however, salmon was plentiful.

Especially in the autumn we had the most beautiful Fata Morgana, with castles and ships high up in the clear air, while also the outlines of the coast were quite changed. The explanation of this is the great difference in temperature between the air and that of the new ice, which has still the temperature of the water. Our meteorologist, Mr. Wegener, studied these phenomena with great skill, and moreover had the magnetic and electrical observations.

In the beginning of November the sun left us for good, the red colours of the southern sky grew fainter and fainter, while from the north darkness spread all along the sky. The temperature went down, in February and March it was as low as −58° Fahr., but in periods it would again rise to 32° and even to 34°. Mr. Wegener sent up his kites and balloons throughout the whole winter, and the instruments often registered a much higher temperature in the upper strata of the air.

As a rule, the weather was calm and clear, but when the barometer sank, the temperature rose, and the sky became overcast; we all sought shelter, for then we knew that a storm was coming, drifting the snow high above the masthead, and generally lasting for two or three days.

We spent two years in Greenland, and in the two years the weather was quite different. (The winter of 1906–07 was cold and calm, the winter of 1907–08 milder and more windy. The ice in the first winter grew 6 feet thick and broke up very late, in the second it was only 4 feet thick.) In the middle of February the sun came back, and May and June were a period of fogs and faint sea breezes. Otherwise, the wind was constantly from the north-west, coming from the high pressure of air which is found over the inland ice. The climate was very healthy, and we had no diseases at all. The only time our physician, Dr. Lindhard, was acting in his official capacity was once when we had been poisoned by a bear's liver.

We found no living Eskimo, but everywhere along the coast up to the Danmark fjord we found their tent stones, their meat caches, and in some places even winter dwellings. From kayaks and umyaks they have hunted the same animals which we found there, and besides whales and reindeer which we did not find. Our ethnologist Thostrup made a very interesting collection of their various tools, etc.

Outside the coast the pack-ice was moving southward with the polar current, and we have mapped out the border of this pack-ice, which showed that the current is everywhere following the line of the outer islands and rocks, while in the waters inside this line pack-ice is rarely found. It was rather an interesting fact that we found great lanes in the ice from 80° to 82° N. lat. At the Malemuk mountain we found open water every time, in April, June, and November, the cause of which must, I suppose, be the current. The waters in the fjords was mixed-up

ICE GROTTO IN LAT. 77° N.

LAKE AND FLOWERS, LAT. 77° N.

polar and gulf water, the gulf water probably running in along the supposed Greenland-Spitsbergen ridge and going southward with the polar current.

I had my instruments on a sledge, and by making holes in the ice I was able to carry on investigations even in a temperature of −2° Fahr. In a big fresh-water lake I found salt water, smelling of sulphide of hydrogen, at the bottom. The lake must formerly have been a fjord, but the land has risen so that the fjord became a lake. The geological conditions, as well as the fact that we found the carcase of a big whale at the border of this lake, seem to strengthen this theory. The tides

ESKIMO MEAT-CACHE.

were not very strong; the ordinary difference between high and low water was 5 feet.

Before I conclude I will just tell you the sad story of the last voyage of Mylius Erichsen, Hagen, and Brönlund. As mentioned above, they parted with Koch on May 28 at Peary Land. Mylius Erichsen and his companions continued in a westerly direction, but got into a new fjord. Their return was thus delayed until the arrival of summer made it utterly impossible. They made an attempt to force their way through, but the sledges refused to move in the soft snow, so that they had to give it up.

They remained at Danmark fjord, but their good fortune had quite deserted them, and they found no musk-oxen, only a few hares and geese. And what was worst of all, they could not get away, but were

confined to a very small district for the whole of the summer. In the middle of the summer Brönlund writes in his diary, "No food, no foot-gear, and several hundred miles to the ship. Our prospects are very bad indeed."

However, with admirable energy they kept up their spirits, as shown by a little poem written at this period by Mylius Erichsen, and by Hagen's splendid map-sketches. Their foot-gear was quite worn out by walking on the stony ground, and they tried to make a substitute from the case of their theodolite, but had neither needles nor thread. They tried to spare the lives of their dogs as long as possible, for only by means of the latter could they hope to reach the ship. Those must have been hard days, when they had to shoot the dogs and eat them—almost like eating a dear comrade, for as such we came to look upon our faithful dogs. As soon as they were able to travel they went inshore towards the bottom of the fjord, hoping to find meat for their remaining dogs, and fully realizing the hopelessness of trying to go on with them in their feeble condition. They went further and further inland, but still they found no musk-oxen. An occasional hare was all they got, and it was usually eaten raw by the starving men and beasts. Otherwise they had to live upon their dogs, but the rations were so small that they became feebler and feebler. This must be borne in mind, in order to understand why it took them so long to reach the bottom of Danmark fjord.

It was not till October 19, the day the sun disappeared, that they at last reached the inland ice with their four emaciated dogs and one sledge. Everything superfluous had been done away with, and yet the burden was too heavy for their feeble strength. They made a last desperate attempt to reach the depôt at Lambert Land by walking across the inland ice, and it is wonderful that these three men should have succeeded in covering a distance of about 160 miles, barefoot over ice and snow, in twenty-six days, or about 6 miles a day.

When I recall all this to my memory, when I think of the northerly wind and the darkness, when I consider that every morning they must have crawled out of their dilapidated sleeping-bags, though they can only have had one desire, one craving—that of sleeping the eternal sleep, then my mind is full of sorrow, that I shall never be able to tell them how much I admire them. But they *would* go on, they *would* reach a place where their comrades could find them and the results of their work.

Then at last came the end—the death of Mylius Erichsen and Hagen, a few miles from the depôt, and the last walk of Brönlund, crawling along on frozen feet in the moonshine. With the sure instinct of the child of nature he found the depôt, ate some of the food there, and made everything ready. Then he wrote the last report, so full of manly resignation, wrapped himself up in his fur, and died.

The concluding words of Brönlund's report were: "I perished in 79° N. lat., under the hardships of the return journey over the inland ice in November. I reached this place under a waning moon, and cannot go on because of my frozen feet and the darkness. The bodies of the others are in the middle of the fjord. Hagen died on November 15, Mylius Erichsen some ten days later."

The PRESIDENT (before the paper): We must all feel grateful to Lieut. Trolle for coming from Denmark in order to describe to us the results of the Danish expedition, which lasted two years, during which the little-known fjords and coast of North-East Greenland were explored. At the same time, we must all feel sad that his leader, Mylius Erichsen, is not here to tell his own story. As Lieut. Trolle will tell us, he, and two of his companions, perished whilst they were endeavouring to carry out the work for which they were sent to Greenland. It was not the first expedition which Mylius Erichsen had organized. Six years ago he arranged an admirable expedition to Western Greenland, and many excellent results were obtained, especially in connection with the language, the folk-lore, and the general ethnology of the Eskimo. I am glad to say that these results have been published in English by one of the members of that expedition, Mr. Rasmussen. The expedition about which we are to hear to-night was thoroughly well organized, it having scientific experts in various branches of science. The portion of the coast which this expedition covered links up that coast which was explored many years ago by Sir Lewis Beaumont, and later by Captain Peary with the furthest point on the coast of the east of Greenland then known. This is the gap which has been filled up by the expedition on which Lieut. Trolle served, and I am quite sure that when we have heard his story, we shall be convinced that the expedition in which he took part is one which has added much to our scientific knowledge of Greenland. I will do no more than call upon Lieut. Trolle to deliver his lecture.

The PRESIDENT (after the paper): I must first of all call on M. de Bille, who has been Minister here representing the Danish sovereign for eighteen years, and who is just retiring from that honourable position. He is a well-known figure at these meetings, and we hope we may hear him here often again.

M. DE BILLE: You have rightly observed that I have not that same particular qualification to speak to the Geographical Society as I have had the privilege to do on former occasions; but I have one inalienable qualification left me, and that is that of being a Dane, and it is as a Dane that I venture to offer to the Geographical Society my country's thanks for the honour you do it in listening to the tale of one of our brave sons, Lieut. Trolle, when he tells us the story of his recent Arctic expedition, which I think is quite worthy of your attention. The young lieutenant of the *Danmark* has related to you the objects and the achievements of the Mylius Erichsen expedition, and in good sailor fashion he has not dwelt so much upon their hardships and their dangers as upon the achievements and the story, as it were, of their daily life. To all that, of course, I have nothing to add; but what I desire to submit to you is, that these young men, those who gave their lives and those who came back safely, have not only rendered a service to geographical science, but they have amply proved that their generation in our country is not lacking that enthusiasm, that manly spirit, that power of endurance, and that strength of will which should secure to them the sympathy and the respect of Englishmen, and should allow them to take their place amongst the explorers of much greater nations than ours. Denmark has no small record in the history of

the exploration of Greenland, and the Mylius Erichsen expedition has added to it information of considerable importance. Now Lieut. Trolle is here to hear the verdict of the Royal Geographical Society. The stimulating influence of the Geographical Society and their support is perhaps the greatest benefit they have in their power to bestow; the most invaluable benefit, I take it, and if Lieut. Trolle can take it home with him to his comrades, then I am sure that they will rate it as high as the honours their king and their countrymen have bestowed upon him.

Sir Clements Markham: We have heard from Lieut. Trolle the story of a great piece of geographical work, one of the few Arctic problems that remained to be solved—the completion of the circuit of Greenland. I am particularly interested because in 1877 I did all I could to induce our Council to undertake this very work, I regret to say unsuccessfully. Since then this country has taken a back seat in Arctic exploration. It was not always so. Scoresby discovered 350 miles of that coast of East Greenland; Clavering, going there for another purpose, also did valuable work; but the Danes have persevered, and by that perseverance and thoroughness, and by the continuity of their work, they have done far more than any other country on that difficult piece of coast, East Greenland. The first separate volume that we ever published in this Society was a translation of the admirable work of Captain Graah, and since his time we have read the journeys on the east coast by Holm, Ryder and others, and we have seen how thoroughly they worked; how all the scientific investigations have been carried out in geology and biology, and especially ethnology, and the study of that very remarkable people on the east coast who, I believe, came from the north. Only last October I was listening, at Vienna, to a most interesting paper, by Mr. Thalbitger, on the folk-lore of the East Greenlanders. Having so thoroughly worked out the southern half of East Greenland, the Danes turned to the far more difficult work of exploring the northern side of the east coast of Greenland. It was the aspiration of Mylius Erichsen to complete the discovery of the coast from Point Bismarck to Peary's discoveries. I had not the pleasure of his personal acquaintance, but I corresponded with him a good deal. I knew well what an excellent piece of work he had done on the west side of Greenland; I knew also that he was an accomplished man of letters; his stories and tales of Jutland are well known, and will live. He wrote to me a long letter from his summer retreat on the west coast of Jutland, full of enthusiasm and patriotism, but still thoroughly practical, and he sketched out a plan which entirely coincided with my ideas. I was delighted to find that at last we had found an explorer who had all the qualifications for doing the work. It is a great calamity that we have lost him. He was a great geographer and explorer. He did not die until he had gained the victory, until he had done the work he went out to do, and he died in the midst of his discoveries. There can be no more noble, no more glorious death. I think the meeting will join very heartily with me in congratulating Lieut. Trolle and his gallant companions on the way, the thorough way, in which they carried on and completed the labours of their lamented chief.

Admiral Sir Lewis Beaumont: I have listened to the lecture with very great interest, because it was my good fortune many years ago to take part in Captain (now Sir George) Nares's expedition which explored a portion of Greenland on the western side, and very near Peary channel. It was the last English expedition to that part of the Arctic Regions, and it was distinguished as being the last in which man-hauled sledges were used; and I make that observation because from that time the use of dog-hauled sledges has enabled Arctic explorers to do far more distant work. Our expedition was succeeded by an American expedition, under the command of Major (now General) Greely, and one of his officers, Captain Lockwood,

by the use of dogs, succeeded in passing the point which we had been able to reach by 100 miles. Many years afterwards, he was followed by another American officer, Peary, who is the most persistent Arctic explorer there is, and who is still at work. He has been going to the Arctic Regions for about twelve years, and he passed Lockwood's furthest, and arrived at Cape Bridgeman. And so the western side of Greenland was finally mapped, and it remained for the Danish expedition, the story of which you have heard, to complete the whole by joining Cape Bismarck to Cape Bridgeman. I think a more interesting sketch of an expedition could not have been given than was given us to-night, and that in words which left so much to be understood, which showed the innate modesty of those who had taken part in it, which gave us to understand what innumerable and immense difficulties they had to surmount, and how completely and thoroughly they had done their work. What I was struck with in the description was that the physical nature of the two sides of Greenland are somewhat different. It appears as if there was less snow remaining in summer on the east side than on the west side. The part of Greenland that I saw was never free from snow in the height of summer, but it became extremely soft and wet, and made travelling extremely difficult. Apparently that is not so on the other side, as the lecturer said and showed us by one of the photographs. There were fields of grass and flowers, and much snow had melted away, so that it appears that travelling in the summer was quite impossible, whereas I came back from my furthest in June, and had a long journey in July, and finally had to cross the straits and get to Discovery harbour in August; and that was done with snow still on nearly every part of the shore. Then I notice also what I think is a very good plan—the plan which has been followed by most expeditions which are not English—that the crew was smaller than with us; the staff of the scientific workers and enthusiasts then can be greater, and therefore the work that is done is also greater and, I say, better. You can easily understand that the crew, many of them excellent men, are not inspired and stimulated to do their special work as thoroughly and in the same way as an officer who is a volunteer, or a scientist would be sure to do. I remember the conspicuous zeal and ability with which the few scientific members of our expedition worked; and I dare say those of you who have read Captain Scott's narrative of the National Antarctic Expedition will remember how the scientists in the Antarctic laboured incessantly. I think it was a good plan, and shows careful thought, to take a very small crew, and for most of the expedition to be formed of officers and scientists. I want you also, if you will, to join with me in paying a tribute of admiration to Lieut. Trolle for the splendid way in which he seems to have navigated the ship. He being the naval officer, evidently had charge of the ship, and after the very sad death of the commander of the expedition, became the leader. Everybody who has read a description of Arctic navigation, knows the immense difficulties of it; the constant anxiety and the responsibility which lies upon the navigator. Therefore, from the point of view of his having been navigator throughout, and the chief of the expedition for the last part of it, I desire, as a naval officer and an Arctic explorer of an older generation, to give him my tribute of admiration for the very fine work which was done in his expedition, and for the extremely modest and interesting way in which he has given the story of it.

Colonel FEILDEN: After the admirable tributes given to Lieut. Trolle for his most interesting address, I have very little to add. I must say that I feel it would have been inappropriate if any other nation but Danes had achieved this last great and final success of making the circuit and joining in with the discoveries on the north of Greenland. It almost seems to have been overlooked by the meeting that the great island continent of Greenland is a possession of

Denmark, and that Denmark has achieved a success in that country which perhaps no other nation has ever done, and that is coming in contact with an inferior race and having kept that race exempt from the great misfortunes and evils which generally come from a lower race meeting a superior one. We all owe a debt of gratitude to Denmark for the lesson which she has taught us in dealing with an inferior race. I will not enter into the history of previous voyages, which has been done by Sir Clements Markham and Admiral Sir Lewis Beaumont, but I think I may safely say that no Arctic Expedition appears to have been so well organized to carry out scientific work since the days of Nordenskiöld in Spitsbergen, as that of the late Mylius Erichsen. Every branch of science seems to have been carried on by experts, and the little that we heard of these results from Lieut. Trolle must make us all anxious to hear further. Nothing struck me as more interesting than the remarks he made on the ethnology, and on the ancient range of the Eskimo. Forty years ago we did not even know the insularity of Greenland; we only gathered it by induction from the tides, and from the animal life on the east coast. Now Lieut. Trolle tells us that he has traced the Eskimo encampments up to Denmark fjord. I think there can be very little doubt that the course of the Greenlanders must have been round the north coast of Greenland, and that the track of the musk-oxen and the other animals was the same. But this opens up perhaps the most interesting question of all, in regard to the scientific nature of those discoveries. Whether animals and plants crept back to live in polar regions, from which all life was extinguished by the glacial epoch, or whether it is the remnant of the life which has outlived the glacial epoch, and still lingers on those shores. I feel quite sure that the botanical researches of the expedition will add greatly to our knowledge, because I expect it to be found that the flora of this portion is highly Scandinavian in its character, and that it must have passed across the pole from the north, and not from southward. It is curious the finding of those white wolves; I never heard of such animals before in Greenland as white wolves. I unite in thanking Lieut. Trolle for his most admirable and modest address.

Mr. Bernacchi: I should like to ask Lieut. Trolle one question, and that is, what were the chief difficulties with regard to the motor car, presuming for the moment that the motor car had been more powerful, and the conditions of the surface more favourable?

The President: I am sure that we all wish to associate ourselves with what fell from Sir Clements Markham when speaking of his admiration for the courage of these explorers, and the heroism of those who lost their lives in following what they felt was their duty. Nothing could have been finer than this work, and nothing could have been simpler than the way it has been described to us to-night. We can realize clearly enough how intolerably disagreeable much of this work must be. We also realize clearly how very pleasant it is to listen to it here, and it is for that pleasure we thank Lieut. Trolle very sincerely. I am sure I may do that in the name of every one here to-night.

Lieut. Trolle: I am very sorry that I am unable to express myself in English as well as I should like to do now, to tell you how deeply I am touched, and how much I should like to thank you for all the kind words that have been said to me and about my comrades on the expedition, and I should like to say that I am very proud to hear these flattering words about the Danish expedition from this Society, which is second to none in the world. Whenever you look on the chart, you will find everywhere the names of famous English explorers; and when I remember the distinguished names of Franklin, McClintock, M'Clure, of Nares, of Markham, or Beaumont, of Scott, and many others, I must say that I

am very proud, that now my name and those of my comrades may be included among these names, after having done some work in Arctic exploration. I only want to express my feelings of thankfulness and gratitude.

About the motor car. I do believe, when the surface is very hard, say on the inland ice, and you have a stronger motor car than we had, then it may very well act. The roughness of the ice is nothing, but on the snow the motor generally will be too heavy, and go through; on the inland ice where the surface is hard, I think a big motor car would be very useful.

DR. SVEN HEDIN'S JOURNEY IN CENTRAL ASIA, 1899–1902: SCIENTIFIC RESULTS.*

By Major W. BROADFOOT.

THE larger part of this work, on a great scale, was briefly examined in June, 1906 (*Geographical Journal*, vol. 27, pp. 606–613). It consisted mainly of descriptions of journeys about the Takla Makan and of the country round Lob Nor, a shifting lake in which the drainage of a vast horseshoe of mountains is ultimately received and lost in the expanse of surrounding sand. There now remain for consideration vols. 3 and 4, in which the detail of journeys through North and East Tibet and Central and West Tibet are recorded; it is not proposed to examine these very closely, for they have presumably received sufficient attention in the reviews of the popular edition of 1903.† Still, a few notes on these volumes may be of service to future students.

A commencement is made by describing in minute detail—as, indeed, all Hedin's descriptions in this book are—his first trip in North-Eastern Tibet. Starting from Kárá Koshan, which readers will remember is the present Lob Nor, he set forth to cross the Astin Tágh (the Altyn or Altin Tágh of our maps) and various other ranges, chief of which is the Arka Tagh, back by the west side of Kum Kul to Temerlik. The letterpress, practically a diary, can be followed on his route-maps, which are beautifully drawn and distinct. They begin for this part of the work at Plate 29, and the text is more or less a descriptive commentary on the map. Taken together and fitted into the R.G.S. map of Tibet, a student will acquire almost as much information about the country passed through and its surroundings as is possible without an actual visit. All sorts of information concerning it may be gathered; its configuration, its capabilities in the way of supply of forage and water, and the presence or absence of wild animal life are recorded. Thus in one place we find camels, yaks, antelopes, hares, and partridges; whilst in another, not necessarily very far distant, animal life down to insect

* 'The Scientific Results of a Journey in Central Asia, 1899–1902.' By Dr. Sven Hedin. Stockholm: Lithographic Institute of the General Staff of the Swedish Army; London: Dulau & Co.; Leipzig: F. A. Brockhaus.

† 'Central Asia and Tibet.' By Sven Hedin. Hurst & Blackett.

pests is absent, and there too, it seems, disintegration of rock is most rapid. This again leads to an abominable and treacherous surface soil, which was "as soft and spongy as a morass, and consisted of fine yellow plastic clay and mud. Owing to the *débris* on the top, it wore a deceitful appearance of being able to bear, and yet the animals sank in a foot deep."

Dr. Hedin rightly protests against the introduction of foreign names for the hills and localities in Tibet, and he seems specially to resent the use of the name Colombus, which appears plentifully in America and need not be transplanted to the heart of Asia. We agree with the sentiment; but it must be recollected that the native names about that part of the world seem more than usually casual and transitory. Thus Astin Tagh means merely "the lower range"; Kar-yakkak, "where the snow falls." And many others are scarcely distinctive in a country a network of hills where snow falls heavily over the greater part.

A fact noticed by Dr. Hedin in this Tibetan lake-land was that of two lakes at no great distance apart and connected by a river, in one the water was fresh, the grazing round it good, and the game abundant, whilst in the other the water was salt and its surroundings were desolate. Resulting from this mixture of fresh and salt water are in places a series of ice-sheets amidst tracts which were free from ice. The former might or might not be strong enough to bear traffic; the latter was so soft that animals sank in it to their knees. Where fresh water prevailed the ice was thick, where salt water predominated there was slush or no ice, and intermediate proportions of the waters gave, as might be expected, thicker or thinner ice. So when a stream of fresh water entered a salt lake, it is recorded that "The farther we advanced from the mouth of the stream the thinner grew the ice; thus it was evident that it was only the fresh spring water that had frozen, forming, at any rate in the western part of the lake, a coating of ice upon the top of the salt lake-water. This process is in a high degree facilitated by the extraordinary shallowness of the western part of the lake."

On the way back to Temerlik the gold-mines at Toghri-sai were visited; they seem to be worked by small bodies of men, from thirty to forty, for about a month at a time, and the yield is said to be poor. Further on rock pictures of animals and hunters were seen, and at one of the camps evidence that Mongols had travelled that way was found. The Turgut Mongol pilgrims, on their way to Lhasa, pass through Temerlik and Tsaidam. Temerlik was made a headquarters, whence many expeditions were carried out; these need not be considered in detail. Hedin's great excursion was through the Astin Tagh as far as Anambaruin-Ula, across the deserts of Gobi and Lob, along the Kuruk Tagh, by Kara Koshan and Charklik, and was described for the most part in vol. 2, which has already been reviewed. Of the Tibetan portion (Akato Tagh) of the journey he writes, "Everything was dead and desolate,

not a sign of either animal or plant; even the ravens, which were generally wont to keep company with the caravan, failed to find their way in here. The region was perfectly still and peaceful." The country traversed became more and more difficult, till at last it became impassable and steps had to be retraced. The Russian map of the General Staff is severely criticized; it was found all wrong, adorned with an imaginary range on which the extent of perpetual snow was duly recorded, with as much insistence as if it had been "the Arka Tagh, the very backbone of Asia. On sheet 62 of 'Stieler's Handatlas' this imaginary range has been a good deal toned down, but on the map of Tibet and the Surrounding Regions, issued by the Royal Geographical Society, it figures in all its pseudo-splendour. Thus as one result of the first few days of this present excursion I was able to eliminate from our maps a misleading and vexatious blunder."

Dr. Hedin tells us he has crossed the Arka Tagh in spring, summer, and autumn, on each occasion having been caught in a snowstorm. On this journey he records that it was twilight at noon; the glen, absolutely barren, was covered sides and bottom with snow, constantly deepening as the fall continued, the only relief being the stream whose course was marked as by a dark winding ribbon. He pushed on towards Lhasa, but was turned back by the Tibetans when within one march from Nam-tso, or Tengri Nor. Thence he journeyed west, following the general direction travelled by Bower, Littledale, and others, to Ladak and Kashmir. *En route*, when on the top of a high mountain, seeing the numberless ranges like waves at sea, he moralizes and justly remarks on the insignificance of a single exploring itinerary in a country so large and so hilly, and he recognizes that as regards the geography of Tibet we merely possess a glimmering of its main features, but cannot say that we have even the rudest reconnaissance map of the *whole* of Tibet.

Certain journeys and reports by other travellers are examined and commented on, special importance being assigned to Grombtchevski's in the Pamir, Karakoram, and Western Tibet. Robert Shaw (1867) is mentioned as the first traveller since Marco Polo to give an account of Cherchen, valuable though based only on hearsay. Forsyth's mission to Yakub Beg (1873–4) is referred to, and finally Younghusband's mission to Lhasa, with the action of the British Government thereon, is mentioned.

Volume 4 closes with a description of the orography of Tibet, in which reference is made to a general map which has not been provided; the omission will no doubt be rectified when the account of more recent travel is published. Vol. 6, Part iii., "Racial Types from Western and Central Asia," consists of a number of remarkably clever sketches of the natives of those parts; we may repeat now, what has before been affirmed, that the author's attainments as an artist both in figure and

landscape-drawing are among his greatest accomplishments, if, indeed, they are not supreme.

We have also commented on the system of transliteration followed in the English edition of this work, and of the unnecessary trouble caused by it, and by the use of foreign standards of measurement, to English readers. It is comical and a little puzzling to recognize the well-known Zoji La under the disguise of Sodschi-la, and Takht i-pari, the fairies' throne, as Dschinri (Tokta-pärä); but what is to be made of Nesamorsajuschtscheje, or the "Non-freezing," a name given by "Prschevalskij" to a lake?

The out-turn of the volumes, the reproduction of photographs and sketches, and the fewness of the printer's errors, are in the highest degree creditable to the Lithographic Institute of the General Staff of the Swedish Army.

ON THE IMPORTANCE OF AN INTERNATIONAL EXPLORATION OF THE ATLANTIC OCEAN.*

By Prof. OTTO PETTERSSON and Prof. GERHARD SCHOTT.

I. The Investigation of the Atlantic Ocean is One of the Most Important Oceanographical Problems to be attacked in the Near Future.

1. In regard to Oceanography and Climatology. All deep-sea expeditions of later years have started from Europe to the southward, and have occupied themselves principally with the eastern half of the South Atlantic. But about the interesting and complicated conditions of the western half of the North Atlantic ocean, within the boundaries of the Gulf Stream and the Labrador Current, no systematic deep-sea research has been made with modern instruments and by modern methods since the days of the *Challenger* expedition, excepting some observations of the U.S. s.s. *Albatross*. There can hardly be any doubt that what is going on in the western part of the ocean will furnish a key to what is going on in the eastern part, that is to say, on the European side.

We know nearly nothing about the magnitude and laws of the changing variations of the Atlantic currents in regard to strength or temperature. In this respect a foundation ought to be laid for all later investigations. The non-periodic changes in the temperature of these currents, principally those of the Gulf Stream, are of vast importance for western Europe. Their causes must be looked for in the Gulf Stream itself. Hence the necessity of following it up to its origin further westward. By careful investigations of different scientists it appears very probable that these non-periodical changes in the Atlantic temperature have a deep and far-

* At the ninth International Geographical Congress, which met at Geneva from July 27 to August 6, 1908, Section VI. was devoted to oceanography. In the absence of Sir John Murray, of Edinburgh, senior representative of oceanographic research, Prof. Krümmel, of Kiel, presided. Prof. O. Pettersson, of Stockholm, and Prof. Schott, of Hamburg, each of them, read a paper explaining the necessity of commencing as soon as practicable an exploration of the Atlantic on an international basis in respect to its physical and biological conditions. The substance of the two papers is given in this article.

reaching influence, not only upon the weather, but also upon the vegetation and the harvest results of Europe. A study of the primary causes of these changes is thus not only of purely scientific, but also of great practical interest.

2. In regard to Meteorology and Aërology, oceanographical expeditions upon the Atlantic ocean will open up regions hitherto nearly altogether closed, namely, the investigation of the physical conditions of the higher strata of the atmosphere above this ocean. In this respect the forties and fifties of latitude seem specially important for Europe, because the highways of barometric depressions run here about west-east and south-west-north-west. It is mainly the direction and frequency of these great atmospheric whirls which decide the character of the weather in European countries. These oceanographical and meteorological factors are so closely interwoven that it is at present yet impossible to say what is cause and what is effect.

3. In Biology. The young eels of northern Europe, hitherto unknown as to form, have at last been found to the westward of Ireland, in depths of 500 fathoms (1000 metres). This experience shows how far to seaward fish will wander, which in later stages are caught nearer to land. Similarly, Mr. Hjort's investigations have proved that other fish in its young stage is found in great depths of the northern seas of Europe far away from land. Thus there is every reason to expect that if such fishery investigations are extended to the open Atlantic ocean, many surprises are yet in store for us.

As far as the fishery of western Europe is concerned, a careful study of changes in the Atlantic plankton with regard to season and place, is of great importance, because plankton, being the original food of the sea, must influence in some way or other the wanderings of all fish.

4. The international exploration of the sea near western and north-western Europe commenced in 1902, and has done splendid work, but to finish it the adjacent parts of the Atlantic ocean should be investigated in a similar way. The English channel, the North sea and the Baltic are only small dependencies of the Atlantic, and a knowledge of their temperature, currents, etc., must always remain incomplete as long as we are ignorant of the corresponding factors within the Atlantic itself, from which they depend. The international investigations in the seas adjacent to our shores, as carried on at present, find their natural continuation and their necessary completion only in Atlantic researches.

II. Those Parts of the Atlantic Ocean which recommend themselves first for Investigation.

5. A straight line from Fair Isle or the Pentland firth to Belle Isle strait across the Labrador Current. The Canadian Government ordered during recent years the execution of important oceanographical work within the waters of Newfoundland. It ought to be possible to connect such work in future with an international exploration of the Atlantic ocean.

6. The great highway between the English channel and the east coast of the United States—that is to say, in the fourties and fifties of latitude. Although this region is traversed by far more ships than any other part of the seas all the world over, it is scientifically considered one of the most unknown regions of all oceans. It is true that many cable steamers have sounded the bottom everywhere, but with the relief of the bottom our knowledge is nearly at its end. Looking at the importance of the Gulf Stream in connection with the climate of western Europe, one should have expected that the European nations had thoroughly investigated this region of the ocean, because it is so much in their own interest. However, the history of ocean research shows in this case again that so often

things which affect us directly are neglected, while those of less immediate interest to us are cultivated.

7. A line between a point on the coast of Morocco and one on the coast of the United States, say, Cape Hatteras. It appears that on this line very important dynamical factors are at work, influencing greatly the oceanic circulation. This section would cut the "cold wall," the Gulf Stream, the northern part of the Sargasso sea, and the cold water near the coast of Africa, coming up here to the surface from greater depths under the influence of the off-shore winds.

8. Corresponding series of soundings in a north-south direction or north-east-south-west towards Pará, cutting the Guinea current if possible, would complete the picture of the North Atlantic circulation and offer material for representing and calculating quantitatively the hydrodynamic fields existing in this part of the ocean.

9. As to the South Atlantic, it will be sufficient to remind the reader that a strong and active interest for the investigation of the neighbouring seas has been shown by the Argentine Republic and the Cape Colony, which co-operating factors must be taken into account whenever an international combination is formed. Besides this, for 1910 and the following years a renewal of the successful Scottish expedition into the Weddell sea is to be expected.

III. On Working Methods.

10. In the North sea and in the Baltic, observations, following an international agreement, are made at regular intervals on the same tracks. Similar trips upon the before-mentioned tracks of the Atlantic ocean promise the greatest and a sure success. However, for the first *it is recommended to limit such a synoptic oceanographic survey only to one year*, because it is necessary and safest to make first only a flying survey of the deep-sea layers.

11. As indispensable observations for all who will take part in the international deep-sea research, might be considered—

(*a*) Salinity at definite depths.
(*b*) Temperature at definite depths.
(*c*) Samples of plankton.
(*d*) Samples of bottom.

12. The international normal values and constants should be adopted, as metrical measure, Centigrade degrees, standard methods in analyzing.

13. Current observations made from vessels *at anchor*, or from bays in certain districts would be very valuable, for instance, in the Straits of Florida, near the banks of Newfoundland, upon the Wywille-Thomson ridge, in the Straits of Gibraltar, and so on.

14. The following observations might be made or not:—

(*a*) Measurement of gases.
(*b*) Measurement of alcalinity.
(*c*) Measurement of radioactivity.
(*d*) Setting adrift bottles or buoys, etc.

15. The observations made by all participants should be worked up at once on board, if at all possible.

16. During the periodical seasonal trips in the Atlantic for deep-sea research, masters of vessels should be requested to make surface observations uninterruptedly, but in greater extent only near the tracks recommended for deep-sea work. Such observations are—

(*a*) Samples of surface water for measuring the salinity by chloro-titration.
(*b*) Samples of surface plankton.
(*c*) Measurement of the surface temperature.

IV. Organization in General.

17. It does not appear necessary to have a special head office. Every nation participating should be at liberty to investigate certain regions by its own specialists at its own costs. To prevent unnecessary work, a committee chosen by the Geographical Congress might, in co-operation with representatives of the different nations, distribute the different tracks or sections thereof amongst all co-operating parties.

18. The working up and publication of the observations made upon the tracks may also be left to each nation, although uniformity in the way of publishing would be desirable.

19. The working methods must be on all accounts internationally fixed and the same for all to ensure strict comparability (see III. On Working Methods).

20. Of course the interest of the governments of the Atlantic states of Europe, Africa, and America should be first solicited; but besides them also that of private people, of polar expeditions, and of owners of good-sized steam yachts should be awakened. Principally, however, it is necessary to gain the interest and the all-important assistance of the great steamship companies.

V. First Steps for Organization taken at the Ninth International Geographical Congress.

The Congress has adopted the following resolution: "The Ninth International Geographical Congress at Geneva declares that the physical and biological investigation of the Atlantic ocean is one of the most pressing problems in oceanography. The civilized nations of Europe, Africa, and America should feel themselves engaged to attack this problem. The beginning of this oceanographical work is urgent first in the immediate interest of the Atlantic shipping, and secondly in the great interest of fisheries and meteorology."

Besides this resolution the Congress consented at its last meeting to the following steps: The chairman of the section "Oceanography" has been authorized to ask several oceanographers and persons connected with natural science to become members of a "Committee for exploring the Atlantic Ocean," or, shorter, of an "Atlantic Committee," and to represent the various nations.

It was impossible to elect at once the members of the committee, because a great many of those interested were not present at the Congress. As soon, however, as they have intimated their willingness to become members of the committee, the committee will be considered as constituted, whereupon a meeting will be arranged as soon as convenient. The entry of representatives of special branches of science, as, for instance, meteorology and zoology, is specially provided for. Moreover, the chairman of the oceanographical section has been requested by the Congress to inform the different governments of the resolution.

In connection with this plan it appears important to mention a similar one, proposed by Prof. Vinciguerra, of Rome, with regard to the necessity of a modern investigation of the Mediterranean, in particular the western part. A motion to that effect was also carried by the Congress. Perhaps it may be possible to combine both plans up to a certain extent, the investigation of the open Atlantic ocean and of the Mediterranean, and to work hand-in-hand. The prospects of this combination seem to be favourable, as the next International Geographical Congress in the year 1911 will be held at Rome.

NOTES ON AN EARLY AMERICAN ARCTIC EXPEDITION.*

By Dr. HENRY E. BRYANT.

Now that the achievement of the North-West Passage is an accomplished fact, and the time has arrived when the history of those famous voyages can be written in its entirety, I wish to submit some notes relating to what was probably the earliest American expedition scientifically planned to explore the Arctic Regions, and whose vowed object was the discovery of the North-West Passage.

Following a long period of inactivity in Arctic research in England, and when we were still loyal subjects of his Britannic Majesty George II., this ambitious project was planned and consummated in the city of Philadelphia, in the year 1753. The city of Penn, from its geographical position in the middle of the line of colonies on the Atlantic coast, had developed along lines of material and intellectual progress to a commanding position among the British colonies of North America. As early as 1742 its public-spirited citizens had raised funds to send John Bartram, whom Linnæus had described as "the greatest natural botanist in the world," on an extensive collecting trip to Oswego and Lake Ontario, in the present State of New York. That interest in this arctic enterprise was not local is shown by the circumstance that merchants from Maryland, New York, and Boston were among the subscribers to the expedition. As was to be expected, the alert and progressive Franklin was interested in the undertaking, and in a letter to Jared Eliot, dated thirty-eight days after the departure of the vessel, writes: "Our vessel, named the *Argo*, is gone for the North-West Passage, and the captain has borrowed my journals of the last voyage."† Over two years later, in a letter to Peter Collinson, he expresses the intention of some day gathering together and sending to his friend all the papers and letters he has relating to the expedition.‡ Whether or not the philosopher carried out this intention doth not appear, and it must be admitted that the available contemporary data bearing on the expedition are rather meagre. The pages of the *Pennsylvania Gazette*, published in Philadelphia by Franklin, contain several brief references to the undertaking; but the most circumstantial record of the voyage is contained in a work published in London in 1768, entitled 'The Great Probability of a North-West Passage,' by Thomas Jefferys. The author of this rather ponderous publication refers to the American expedition in his preface, and reproduces in the appendix the most interesting part of the log of the commander, Captain Charles Swaine, although, strangely enough, the name of this gentleman nowhere appears in the book.

From the above sources we learn that the schooner *Argo*, sixty tons burden, with fifteen persons aboard, Charles Swaine, master, sailed from Philadelphia on March 4, 1753, to discover the North-West Passage, which was believed at that time to lead from the western shore of Hudson bay to the Pacific.

According to the preface of Jefferys' work, the scheme of the expedition was a bold and comprehensive one, for we learn that the *Argo* was "fitted out on a subscription of the merchants of Maryland, Pennsylvania, New York, and Boston, on a generous plan, agreeable to proposals made them, with no view of any monopoly which they opposed. Not to interfere with the Hudson's bay trade, nor to carry on a clandestine trade with the natives of Greenland, but to discover a

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* Read at the Ninth International Geographical Congress, Geneva, August, 1908.

† 'Life and Writings of Benjamin Franklin.' By Albert Henry Smythe. Vol. 3, p. 123.

‡ *Ibid.*, p. 268.

North-West Passage, and explore the Labrador coast, at that time supposed to be locked up under a pretended right, and not frequented by the subjects of England, but a successful trade carried on by the French; to open a trade there, to improve the fishery and the whaling on these coasts, cultivate friendship with the natives, and make them serviceable in a political way."

The departure of a vessel on a voyage, so charged with possibilities of adventure and discovery, must have been an event of unusual interest in the annals of the quiet colonial city, and doubtless a throng of well-wishers assembled on that bleak day in early March to wish the voyagers Godspeed. We learn from the *Gazette* of May 10 that the *Argo* "having touched at Hiannas, near Cape Cod, and at Portsmouth, in New England, to take in her complement of hands and some particular necessaries, took her departure from the latter place on April 15, all well on board and in high spirits."

No further news of the expedition was heard for over seven months, until the arrival of the *Argo* at Boston was reported on October 21. The issue of the *Gazette* of November 17 chronicles the return of the storm-tossed little craft, and gives an interesting *résumé* of the voyage. In the quaint phraseology of the period this reads as follows: "Sunday last arriv'd here the schooner *Argo*, Captain Charles Swaine, who sailed from this port last spring on the discovery of a North-West Passage. She fell in with the ice off Farewell, left the eastern ice, and fell in with the western ice in lat. 58° and cruised to the northward to lat. 63° to clear it, but could not, it then extending to the eastward. On her return to the southward she met with two Danish ships bound to Ball river and Disco up Davis straits, who had been in the ice fourteen days off Farewell, and had then stood to westward, and assured the commander that the ice was fast to the shore all above Hudson straits to the distance of 40 leagues out, and that there had not been such a severe winter as the last these twenty-four years that they had used that trade; they had been nine weeks from Copenhagen. The *Argo*, finding she could not get round the ice, pressed through it, and got into the strait's mouth on June 26, and made the island Resolution, but were forced out by vast quantities of driving ice, and got into a clear sea on July 1. On the 14th, cruising the ice for an opening to get in again, she met four sail of Hudson bay ships endeavouring to get in, and continued with them till the 19th, when they parted in thick weather in latitude 62½°, which thick weather continued to August 7; the Hudson bay men supposed themselves 40 leagues from the western land. The *Argo* ran down the ice from 63° to 57° 30′, and after repeated attempts to enter the straits in vain, as the season for discovery on the western side of the bay was over, she went on the Labrador coast and discovered it perfectly from 56° to 65°, finding no less than six inlets, to the heads of all of which they went, and of which we hear they have made a very good chart, and have a better account of the country, its soil, produce, etc., than has hitherto been published. The captain says 'tis much like Norway, and that there is no communication with Hudson bay through Labrador, where one had been heretofore imagined, a high ridge of mountains running north and south about 50 leagues within the coast. In one of the harbours they found a deserted wooden house with a brick chimney, which had been built by some English, as appeared by sundry things they left behind; and afterwards in another harbour they met with Captain Goff in a snow* from London, who informed that the same snow had been there last year, and landed some of the Moravian brethren, who had built that house; but the natives having decoyed the then captain of the snow and five or six of his hands in their boat round a point of

* A kind of vessel then in use resembling a brig.

land at a distance from the snow, under pretence of trade, and carried them all off (they having gone imprudently without arms), the snow, after waiting sixteen days without hearing of them, went home, and was obliged to take away the Moravians to help to work the vessel. Part of her business this year was to inquire after those men. Captain Swaine discovered a fine fishing bank, which lies but 6 leagues off the coast, and extends from lat. 57° to 54°, supposed to be the same hinted at in Captain Davis's second voyage. No bad accidents happened to the vessel, and the men kept in perfect health during the whole voyage, and returns all well."

Although unsuccessful in the main object of their quest, it must be admitted that these Pennsylvanians made a real contribution to the knowledge of the Labrador coast in exploring so considerable a stretch of its seaboard, and in charting six of the numerous inlets which indent the coast. As is well known, the Labrador current carries vast quantities of "driving ice" and bergs down the coast during the spring months, making the navigation of the rugged Labrador coast almost impossible for small craft at that time. So well are these conditions known to-day that the staunch little steamer which carries the mail along this coast is seldom dispatched from St. Johns, Newfoundland, on her cruise northward until the end of the first week in July. We are not surprised therefore that our mariners encountered such adverse conditions, and their courage in pushing their vessel through the heavy ice at the entrance to Hudson strait deserved a better outcome. That the promoters of the voyage were pleased with the management of the expedition is shown by an item of news which appeared on November 29, in the same journal from which I have already quoted, "Several of the principal merchants and gentlemen of this city who, with other merchants and gentlemen of North America, subscribed to fitting out Captain Swaine in the schooner *Argo* on the discovery of a North-West Passage, met at Bull's Head in this city, on the 23rd inst., and expressed a general satisfaction with Captain Swaine's proceedings during his voyage, though he could not accomplish his purpose, and unanimously voted him a very handsome present."

So great was the interest aroused by this venture that a second voyage of exploration with the same objects in view was dispatched the following year under the same leadership. Referring to this later expedition Jeffery says, "The next year a second attempt was made as to a passage, but three of the people who went beyond the place appointed by their orders, and inadvertently to look for a mine, samples of which had been carried home the year before, were killed by the Eskimo and the boat taken from them. After which accident, with some disagreeable circumstances consequent thereon amongst the schooner's company, and after an experiment made of their disinclination to proceed on any further discovery, it was thought most prudent to return."

The return of this second expedition is chronicled in the *Pennsylvania Journal and Weekly Advertiser* for October 24, 1754. Soon after his return from this second voyage Captain Swaine turned over to the Library Company of Philadelphia, as a present from the North-West Company, a number of costumes, utensils, and "curiosities," illustrative of the life of the Eskimo of the Labrador coast. Like the memory of the voyage itself, these ethnological objects have disappeared.

While painstaking local historians, such as Watson in his 'Annals,' * and Scarf and Westcott in their 'History of Philadelphia,' † make brief references to Captain Swaine's voyage, the writer deems the story of what was probably the first American

* Watson's 'Annals of Philadelphia,' vol. 2, p. 495.

† Vol. 1, p. 246.

Arctic expedition worthy of preservation, both as a creditable incident in the early history of Philadelphia, and as a modest contribution to the annals of Arctic achievement in general.*

REVIEWS.

AFRICA.

THE ASCENT OF THE RUWENZORI PEAKS.

Ruwenzori: an Account of the Expedition of H.R.H. Prince Luigi Amedeo of Savoy-Duke of the Abruzzi.' By F. de Filippi, F.R.G.S., with a Preface by H.R.H. the Duke of the Abruzzi. London: Constable. 1908. Quarto. 31*s.* 6*d. net.*

'Il Ruwenzori, Viaggio di Esplorazione e primi Ascenzioni, Relazione del Dott. Filippo de Filippi. Illustrata da Vittorio Sella. Milan: Hoepli. 1908. Quarto. *Unbound*, 9*s.* 3*d.*; *in cloth*, 12*s.*

This handsome volume furnishes a satisfactory record of a singularly successful expedition. The author, Cav. F. de Filippi, was not one of the Duke of the Abruzzi's companions in Africa, and he has therefore had to put together a narrative from the various journals and memoranda of members of the expedition. However great the skill of the compiler, a report framed in this manner can hardly succeed in equalling in graphic detail a story told at first hand. To realize this we have only to turn to the short but very vivid and valuable article contributed by Dr. Roccati, the geologist attached to the Duke's expedition, to *La Montagne* (the periodical of the French Alpine Club) for November last. But Cav. de Filippi has come as near success as, in the circumstances, was possible. He combines the technical knowledge of a mountaineer with an artistic touch, and were it not for the frequent use of the third person, his readers might often be persuaded that he was describing his own experiences. The geographical disquisitions are clear, the narrative throughout quick and lively, while adequate justice is done to the romantic scenery of one of the most strange and fascinating regions on the Earth's surface. Madame de Filippi, the translator of the English edition, must also be congratulated on the excellent style and thoroughness in all technical details of her share in the work.

Many causes contributed to the complete success of the Italian expedition in a field where so many had failed. First amongst these must be reckoned the energy and persistence of its commander. But it had also in its favour other circumstances, one of crucial importance. Its immediate predecessors had brought back to Europe a secret, up to that time locked in the breasts of one or two missionaries in Toro, and hidden even from the officials at Entebbe: the time of year of the relatively fine season on the mountain. For there can be no comparison between the broken weather complained of in Cav. de Filippi's pages and the torrential rains of other seasons. We read, it is true (on July 15) of fifteen days of "continuous rain." But a reference to the Table of Ascents shows that on nine of these fifteen days one or more of the loftier peaks were climbed. Moreover, while approaching the mountain the party were favoured with frequent views of the snows, which enabled them to resolve the puzzle created by the juxtaposition, from some points of view, of Mounts Stanley and Speke, and by Sir H. Johnston's erroneous identification of the latter (his Duwoni) with the peaks immediately

* Subsequent to the completion of this paper, the writer's attention was called to an interesting article relating to the same subject by Mr. Edwin Swift Balch, which appeared in the *Pennsylvania Magazine of History and Biography*, vol. 31, No. 124, which was printed in June, 1908.

to the north of the Mobuku glacier. An additional advantage possessed by the Duke of the Abruzzi was an ample supply of the sinews of war, which enabled him to employ any amount of native labour in path-cutting through trackless forests and, further, to provide himself not only with firstrate Alpine guides, but also with European servants and porters for work above the level accessible to shoeless natives. Finally, the resources and services of the local government were placed at his disposal in a way they never had been for any British travellers. But opportunities are only useful to those who know how to use them, and no one will question that the Duke of the Abruzzi and his companions fully deserved and made the best possible use of their good fortune.

Our Fellows have already had before them, in the excellent paper read by His Royal Highness to the Society, an account of the achievements of the expedition, and their geographical results were carefully analyzed in a subsequent number (vol. 29, p. 326). To summarize them again here would therefore be superfluous. In the present volume a not too lengthy sketch of the journey up from the coast at Mombasa forms an appropriate introduction to the main story of exploration and climbing adventure. The text affords also fresh particulars as to an independent excursion made by Cav. V. Sella (not indicated in the map), in which he crossed the chain, descended the western glaciers of Mount Stanley, and identified features previously photographed by Dr. Stuhlmann. Several appendices record the work accomplished by the expedition in various branches of science. The highest peaks consist either of gneiss or amphibolite schists. The English edition is furnished with a geological map, but a summary only of the geological observations is given. They will be published at length in Italy at a later date.

Expert criticism on such a subject must necessarily be rare, and it may be convenient to comment here on certain points raised in Cav. de Filippi's narrative. A reference to Sir Samuel Baker's own work shows that Sir H. Johnston in his 'Uganda' and Cav. de Filippi are both mistaken in thinking the "blue mountains" Baker saw had anything to do with Ruwenzori. They were *west* of Lake Albert. To the south and south-west he saw only a "boundless sea-horizon" (see 'The Albert Nyanza,' vol. 2, p. 94). The reference to J. Thomson, "whose work in Nigeria is well known," is curiously inadequate. By far the most important of Thomson's explorations were made from the east coast. His great journey to Lake Victoria through Masailand, undertaken under the auspices of our Society, was the first step in the succession of events that led to the Uganda railway.

Mr. Freshfield, we are told, has "expressed a poor opinion of the glaciers and of the general importance of the chain." The impression likely to be created by this passage will be confirmed by the use in the English edition of such phrases as "a vast system of snow mountains," and "vast tracts of eternal ice and snow" (pp. 2, 3).* Let us ascertain the facts. Mr. Freshfield estimated the length of the snowy range from end to end at 12 miles, and his lowest guess for the height of the principal peaks was 16,500 feet, while he inclined rather to 17,000 feet or over. Cav. de Filippi gives the total length of the snows as 11 miles, of which 4 miles are snowless depressions; the height he assigns to the highest peak is (barometric) 16,815 feet, (trigonometric) 16,619 feet.† Mr. Freshfield compared the glaciers of Ruwenzori to those of the Buet-Dent du Midi range. The ice on Ruwenzori (as shown on the map) covers about $3\frac{1}{2}$ square miles, while the Swiss

* In the Italian edition no corresponding phrases are found.

† In the map given with the Memoir of Sir S. Baker (1895), the height assigned to Ruwenzori is 16,600 feet—a most fortunate anticipation of more precise measurements, probably derived from Mr. Scott Elliot.

and Savoyard glaciers in question cover over 8 square miles. It is clear, therefore, that it was not in under-estimation that Mr. Freshfield erred! We may add that the Mer de Glace of Chamonix alone covers 16 square miles, and the glaciers of Switzerland (perhaps half those of the Alps) cover over 700 square miles. Ruwenzori has sufficient claims of its own to enable it to dispense with those of mere size. Future writers will do well to avoid hyperbolical comparisons to the Alps and Caucasus, such as were indulged in by some of its earlier explorers, and first corrected by Mr. Freshfield.

It had been pointed out by English climbers that the two highest peaks of the range do not lie on the edge of the Mobuku basin. Mr. Wollaston, in a sketch-map (dated August 12, 1906), had placed them on the watershed. Lieut. Behrens had located accurately their position by trigonometrical observations (*R.G.S. Journal*, vol. 25, p. 43). But it was left to the Duke of the Abruzzi to determine finally the exact position of the five lesser groups and also the relation of the four peaks now collectively named Mount Stanley to the watershed, whether they were on it, or beyond it on the Semliki side. He has proved that three are on the watershed, and the southernmost—the Savoia peak—on the Semliki side. The Duke was able to approach them by the pass indicated to his predecessors as used by the Buamba tribe of the western slope, and then by the head of one of the western valleys that fall to the Semliki. From this central point in the range he recrossed to the head of the Bujuku valley on the eastern slope, before climbing the more northern peaks.

Signor Sella's telephotographs serve to clear up another orographical puzzle. From Butiti, on the Toro road, Mount Speke (Johnston's Duwoni) and Mount Stanley appear as one mountain, and are at times indistinguishable (*R.G.S. Journal*, vol. 29, p. 328). Those, therefore, who have recognized in this view both Duwoni and the highest peaks have only been wrong in not discerning the composite character of the most conspicuous mass of snows in sight. Travellers may also be reminded that from most points on the Toro road the Alexandra peak is merged with the Margherita, and that the second summit visible is, as the Duke points out, the western shoulder of Margherita, conspicuous also in Stuhlmann's photograph from the Butagu valley. From Fort Portal nothing but a few flecks of snow, probably on the peaks of Mount Emin, are in sight; the view is, in fact, from an alpine standpoint, singularly disappointing. In the Duke's map two "South Portal peaks" are shown; one of them, the peak south of the Bujuku valley, is not part of the Portal range; a distinctive name should be found for it.

Much valuable information as to the present and past glaciers of Ruwenzori is here collected. The existing glaciers are all of the class known in Europe as *secondary*. They have no large snowy reservoirs either on flat summits or in upland basins, nor do they descend into the valley bottoms. They cling to the steep mountain-sides, throwing out ineffectual fingers towards the upper glens. Their *névés* are quickly converted by the climate into ice. In short, they are of the so-called "tropical type." It is here suggested that the scarcity of moraines and the clearness of the torrents may be due to the ice being "stationary." This is to assume an almost miraculous exception from the laws of glacier motion. Glaciers which are more or less ice-caps and have no great cliffs impending over them often produce small moraines and clear torrents. It is stated in this connection that Mr. Freshfield holds a theory that tropical glaciers waste only by evaporation. He has never advanced any such general theory. A hasty sentence in a letter to the *Times*, reprinted in the *Alpine Journal*, has been fastened on. The view he expressed in this journal was that the Mobuku torrent might be *in part* the outcome of a subglacial spring (*Journal*, vol. 27, p. 485).

The lakes or tarns in the high valleys prove, according to Dr. Roccati, the geologist of the expedition, to be morainic. He confirms, differing here from Dr. Wollaston, who had previously visited it, Mr. Freshfield's supposition that the lake on the spur south of the Mobuku valley is *not* a crater lake. No one has ever called this pool Lake Kobokoro. The sheet of water bearing that name in Macdonald's map lies out on the plain north of Lake Ruisamba. Numerous traces of glacier action, moraines, rubbed rocks, and boulders, were found for some 8 miles below the existing ice and down to a level of about 5000 feet. The mode of transport of the big boulders which strew the plain of Ibanda is still left undecided. It may be that they are a record of some catastrophe in a long-past period of glacial extension similar to that which recently overwhelmed the Baths of St. Gervais in Savoy. The ridges near Nakitawa, as had been previously suggested, are old moraines.

Whenever Cav. V. Sella is of a party, the record of its doings is sure to have the advantage of magnificent illustrations. We have seen his photographs more brilliantly reproduced. In the English edition the large plates are somewhat worn; but they remain, for the most part, beautiful pictures as well as valuable scientific documents. Sir Harry Johnston had already introduced to the English public the marvellous flowers and forests of the upper glens of Ruwenzori; Cav. Sella carries us through them to the glaciers and the topmost snows. Few portions of the Earth's surface have been so thoroughly depicted as these most remote of African fastnesses now are. The task was no light one. The photographer who can succeed equally on the clear heights of the Himalaya and in the misty, moisture-laden atmosphere of the African summits, must have the most consummate skill in handling his material. Moreover, in order to obtain his crowning success, the panorama from Mount Baker (unfortunately not reproduced here), Cav. Sella had to spend a week camped in a windy gap on the crest of the range, and to shiver for hours in fog on icy summits. That their failures served to send Cav. Sella to depict Ruwenzori should be a sensible consolation to his forerunners.

In an appendix Prof. Hugues argues ably for the recognition of Ruwenzori as the snowy mother of the Nile mentioned by Ptolemy. In our opinion, despite the high authority of Mr. Ravenstein to the contrary, he proves his case. The tradition of such a mountain at the Nile sources has run down the ages, and is frequent in Arab traditions. Occasional communications between Central Africa and the civilized world must have existed long before the lakes were "discovered" by modern travellers, and these communications remained probably much the same from the period of Ptolemy to the middle of the nineteenth century, through the days of Roman and Arab and Turkish domination in Egypt.

I may cite here one curious example of such communications, recorded in the following sentences, which occur in a letter from Mons. A. d'Abbadie, published in the *Athenæum* of February 10, 1849. They contain a very definite report. The phrase "men white like Turks" must, we think, refer to the white robes characteristic of the people of Uganda.

"Baron von Müller has returned from Kordofan. Under 4° and 5° N. lat. the banks of the Nile are inhabited by negroes who are neither Xilak nor Dinka. Their king, called Nikla, gave the following information to the master of Baron Müller's boat.

"'In my youth,' said Nikla, 'I travelled a great deal towards the south, and found there men white like Turks. I saw there the origin of the Bahr el Abiad' (so named, said the boatman, from a very large mountain, whose peaks are completely white). 'The river threw itself from the mountain, which is called the White mountain.' This boatman, who had visited Nikla four times in order to purchase

ivory, had never heard of snow, and could not give any exact idea of the distance from Nikla's country to the far-distant White mountain." *

The English and Italian editions are similar in most respects, though the English has ten pages of geological notes wanting in the Italian.

D. W. F.

The French in the Sahara.

'La Pénétration Saharienne (1830–1906).' By Augustin Bernard and N. Lacroix. Algiers: 1906. x. + 195 pp.

This is one of the useful series of publications prepared by the Algerian Government for the Marseilles Colonial Exhibition of 1906. But despite its temporary purpose, the monograph possesses a permanent value, thanks both to its copious references and to the careful way in which the facts are succinctly summarized. The contents, which are far more varied than might be inferred from its modest title, deal mainly with the gradual exploration of the Western Sahara, by which is here understood that section of the great desert which in the partition of Africa fell to the share of France, extending from the Atlantic to the Turkish vilayet of Tripoli, and from the French Mediterranean possessions southwards to the Sudan.

But the term "exploration" is taken in an unusually elastic sense, so that the volume really embodies a somewhat complete picture of the physical features, the political relations, the natural history, ethnography, and economic conditions of the whole region. This liberal treatment of the subject, which adds so much to the importance of the book, is due to the wise plan adopted by the compilers in describing the details of each successive civil or military expedition. The reports of the leaders are so many official documents, and when they are signed by such distinguished names as De Colomb, Duveyrier, Choisy, Rolland, Foureau, Flamand, or Lamy, we may be sure that they will not be limited to strategic movements, battles, excursions, interviews with Tuareg chiefs, and such-like incidents of passing interest. Thus the numerous documents accompanying the official account of the memorable Foureau-Lamy expedition of 1898–1900, which was the first to cross the desert from Algeria to Lake Chad, are here spoken of as collectively forming a veritable encyclopædia of information acquired along the route and "described with a master hand."

The astronomical and meteorological observations, the geographical aspect of the land, its orography and hydrography, geological formations, flora, fauna, ethnology, and even the discovery of objects throwing light on remote prehistoric times, are all successively passed in review, and a clear picture is for the first time given of the physical constitution of the Sahara itself. In the northern and central districts a

* Leonardo da Vinci writes: "Therefore we must conclude those mountains to be of the greatest height, upon which the clouds falling in snow give rise to the Nile." And again, "The Nile springs from three very high lakes in Ethiopia, and runs northwards towards the sea of Egypt with a course of 4000 miles or 3000 miles in the shortest and most direct line. It is known that it issues from the Mountains of the Moon by several unexplored sources" (Richter's 'Leonardo da Vinci,' vol. 2, p. 264). This may be copied, or deduced, from Ptolemy. But where did Leonardo hear of the *third* lake, or get his material for the height, "1000 braule, or a mile and a third," he assigns to the lakes? Ptolemy mentions the Colse lake, from which the river Astapus flows, but distinguishes it from the Nile lakes.

clear distinction is drawn between two essentially different geological systems, one in which the foldings are of post-Carboniferous age, the other a region of plateaux in which they are much older—pre-Devonian or Silurian. Then the later chalk deposits are shown to develop a vast surface layer which extends equally over both folding areas.

The hydrographic section is peculiarly interesting, since it contains a comprehensive study of the prevailing conditions when the now sandy and shingly wastes (eastern and western Ergs and Hammadas) were traversed by great fluvial arteries, such as the Igharghar basin draining north to the Mediterranean, the Wed-Tafassasset, which apparently trended south-west towards Sokoto and the Niger, the south-eastern wadys of Aïr (Asben), and the problem of Lake Chad, which was not originally a land-locked depression, but, as Chevalier thinks, drained probably to the Mediterranean.

After Foureau's occupation of Agades, capital of Aïr, political events proceeded at a rapid rate, and in this respect more progress was made between 1900 and 1906 than during the previous sixty or seventy years. But although the "Pax Gallica" has now been established amongst most of the turbulent Tuareg groups, the general impression is that their reduction was not worth the expenditure of so much money, blood, and heroism. The whole of the region stretching from the French Mediterranean possessions to French West Africa (Sudan) is declared to be unproductive, barren, and without any industrial or commercial resources, so that "dans l'état actuel des choses, le Sahara n'a aucune valeur, ne produit absolûment rien." On the colonization question the writers are equally emphatic, and here they quote with approval Dr. J. S. Keltie's trenchant remark that "when the earth is so full of people that all the other lands have been utilized for the purposes of humanity, we shall still have the Sahara to fall back upon as a last resource" ('The Partition of Africa,' p. 290). Even as affording a means of communication between the Mediterranean and the Sudan, the Sahara is almost given up in despair, and the numerous trans-Saharan railway projects lately urged by their various promoters are now relegated *ad Kalendas Græcas*.

The book lacks an index, but there is a somewhat copious Table of Contents, and a series of six small maps showing the gradual sway of French rule over the whole region.

A. H. Keane.

AMERICA.

The Conquest of Mexico.

'Letters of Cortés.' The five letters of relation from Fernando Cortés to the Emperor Charles V. Translated and edited by Francis Augustus MacNutt. 2 vols. New York and London: G. P. Putnam's Sons. 1908. *Portraits and Maps. Price 42s. net.*

There is no more fascinating story than that of the discovery and conquest of Mexico by the Spaniards, and although for most readers that story has been sufficiently told by the distinguished historian William H. Prescott, there is a growing need for the reconsideration of the documents that furnished the material for Prescott's glowing pen. First among these stand the letters of Fernando Cortés to the Emperor Charles V., and the garrulous narrative of that gallant old soldier, Bernal Diaz del Castillo, the only two eye-witnesses who described the thrilling events of the conquest. We are therefore duly grateful to Mr. MacNutt for a careful translation of the five descriptive letters now published, all together, in an English translation for the first time. Four only of these letters were written by Cortés himself; his first letter to the Emperor was lost, but its place is taken by

a letter of earlier date addressed to the Queen, Doña Juana, and her son the Emperor, by the municipality of the newly founded city of Vera Cruz, a city which at the time the letter was written existed only in name, and by virtue of the appointment of municipal officers. In a bibliographical note Mr. MacNutt gives a history of the letters, and says that "In preparing this present edition a careful comparison has been made of the various texts known, and, while idiomatic differences have imposed certain rearrangements of form, particularly in the matter of punctuation and the suppression of many cumbersome repetitions, it has been sought to leave to the letters their unique characteristics, due to the personality of their author, and to the temper of their times."

The translation of the letters is preceded by a biographical note of seventy-three pages, in which the character and career of the conqueror is sympathetically treated, and throughout the two volumes there are numerous interesting notes and appendices, the result of careful research. There are of course some slips, such as (p. 86) the attribution of the discovery of the island of Cozumel to Francisco Hernández de Córdova in 1517. Bernal Diaz, who accompanied both expeditions, distinctly states that it was first discovered by Juan de Grijalva in 1518. The note on the Temple (Appendix V.) is not particularly clear, for although it points out Prescott's error, it fails itself in a thorough discrimination between the principal group of temples in Tenochtitlan and that of Tlaltetolco. However, these are small deficiencies to balance against the great gain of a clear translation of the text of the letters.

The frontispiece to the first volume is a reproduction of an engraving by Ferdin Selma after an alleged painting by Titian, which, although conveying an undoubted likeness, does not compare favourably with the portrait by an unknown artist preserved in the Municipal Palace at Mexico.

Peru.

'Peru.' By C. R. Enock. London: Fisher Unwin. 1908. Pp. xxxii., 320. *Map and Illustrations. Price* 10*s.* 6*d.*

This book, which forms the second volume of Mr. Fisher Unwin's "South American Series," would seem to fulfil every requirement of the intending student of, or visitor to Peru. A preliminary chapter gives a rapid survey of the territory, and immediately insists upon the different parallel zones, between the coast-line and the summit of the Andes, and the eastward slope of those mountains, which have constantly to be borne in mind as the prime geographical feature which effects the economic conditions of the country in every department. Eight succeeding chapters are devoted to history. We then have details as to the government and administration, and four chapters giving a close study of the social system, in which the author's powers of observation and judgment are clearly shown; this is perhaps the most interesting and praiseworthy part of the work. The topography and geology, natural history, and climate are next dealt with; then follows the means of communication, fully and carefully studied, as befits a subject of prime importance in a country whose active development, it may be said, is only now beginning. The last section is supplemented in the final chapter entitled "Travel Notes," which, though not cast in the personal form, is clearly a narrative of personal experiences, and is admirable in its way. The chapters on agriculture (in which the division of the country into zones is again especially insisted upon), mineral and other products, and general economic conditions, bear the stamp of intimate knowledge, and while the author fully believes in the possibilities of the country, one misses with relief the too flattering terms which some interested writers have

applied to them. The book is illustrated by good photographs, which have evidently been carefully selected, and inserted with a view to illustrating each successive subject capable of illustration. This arrangement points the contrast between the ordinary traveller's miscellany and the careful and complete study of a country on a geographical basis, of which Mr. Enock's book is an excellent example.

Views in the Andes.

'In the High Andes of Ecuador, Chimborazo, Cotopaxi, etc.' By Prof. Hans Meyer, PH.D. *Portfolio of Plates.* London: Williams & Norgate. 1908. *Presented by the Publishers.*

The volume illustrated by these plates has already been reviewed in these pages (vol. 29, p. 558 (1907)). They include twenty-four large quarto chromolithographic reproductions from paintings by Rudolph Reschreiter and a number of phototypes of drawings and paintings from the Grassi Museum, Leipzig, as well as of excellent photographs.

The coloured plates are very effective. That with which the series commences, the coast of Ecuador off Bahia de Caráques, not only has considerable artistic merit, but recalls very forcibly the bold coast-line of Ecuador and the cool green billows of the western Pacific. The views of Chimborazo from different points are very realistic, besides being of considerable scientific value. In that of the Reiss glacier on the northern side of the mountain both the glacier and its moraines are well shown, and in the foreground appears a wealth of brightly coloured alpine flowers. Another coloured plate shows the remarkable ice-pinnacles known as *nieve penitente*, on account of their resemblance to an assemblage of white-robed penitents. They are only met with where partially consolidated snow is exposed to the rays of a nearly vertical sun. The pinnacles still show the stratification of the once continuous *névé*. Other good examples are the view of the glacier in the crater of Cerro Altar, the double-paged plate of the interior of the crater of Cotopaxi, Antisana from the south-south-west, and the western glacier of Antisana. The last recalls very strikingly the view of Illampu from the Huallata pass. The three coloured plates of plants of high Andean altitudes are also excellent.

In the case of the monochrome reproductions of drawings and paintings, the originals are mostly more than thirty years old, and are in many cases valuable as a record of a state of things which has since been modified. They have not, however, the same scientific value as the photographs. One of these, illustrating the Pistichi rock on the Cordillera railway, gives a good idea of the landslips to which the line is exposed at this point. Very typical of Andean scenery is the view of the east-south-east side of Chimborazo from Tambo Chuquipoquio, and there is an excellent photograph of the glacial scorings at the entrance to the crater of Cerro Altar; for here, as in many other parts of the Andes, there is evidence that the mantle of snow and ice was once more extensive than it is at present.

The portfolio deserves a place in every important scientific library for the sake of its illustrations of scenery affected by volcanic and glacial phenomena, while lantern slides reproduced by colour photography from the chromolithographs would prove of great assistance to lecturers on physical geography and geology. The plates are accompanied by a brief introduction and by explanatory notes, in which the geological, botanical, zoological, and meteorological phenomena illustrated by each plate are carefully noted, and it is only exceptionally that the reader will feel called upon to differ from the explanations that are offered.

J. W. E.

GENERAL.

Early Man.

'Der Mensch zur Eiszeit in Europa und seine Kulturentwicklung bis zum Ende der Steinzeit.' By Dr. Ludwig Reinhardt. 8 + 921 pp.; 2nd edit. Munich: E. Reinhardt. 1908. *Price* 12*m.*

This second and greatly enlarged edition of Dr. Reinhardt's comprehensive treatise on 'Early Man in Europe'—the first was issued in 1906—appears almost simultaneously with M. Déchelette's 'Archéologie Préhistorique,' with which it irresistibly invites comparison. Both cover nearly the same ground, the Old and New Stone Ages, and both follow the same broad subdivisions that are now commonly accepted by palethnologists. Hence in each the Chellean, Acheulean, Mousterian, Solutrean, and Magdalenian periods are carefully discriminated, special attention being paid in both works to the artistic remains of the last mentioned, which answers roughly to the Reindeer epoch of previous French and English writers.

But in other respects the most marked contrasts are presented, M. Déchelette still adhering with dogmatic insistence to the conservative school till lately represented by Sir John Evans in England and Prof. Virchow in Germany, while Dr. Reinhardt unhesitatingly accepts the more advanced views now advocated by M. Thieullen in France, and especially by M. Rutot and others in Belgium. Thus M. Rutot's "conversion" to an Eolithic period prior to the "orthodox" Palæolithic Age is pointedly referred to at the very time when all the so-called "eoliths" are anathematized by Mr. Worthington Smith in unduly sweeping language. This and all analogous topics are treated with such astonishing thoroughness by Dr. Reinhardt that the ordinary reader need not go beyond his encyclopædic work to grasp the points at issue, and even to learn the last word that has been said on these obscure anthropological questions. Thus, to mention one case, reference is made to the 'Neue Menschen, ein Jahr bei den Nachbaren des Nordpols,' a work quite recently issued by Knud Rasmussen on the primitive usages, traditions, and creation myths still surviving amongst the Eskimo of Smith Sound.

This method of illustrating the practices and notions of early man by reference to those of still existing savage peoples is a marked feature of the work, and to it is devoted a long section on the Palæolithic and even "Eolithic" men of the present day. Much valuable information is thus conveyed on the Papuans, Australians, Andamanese, and many other tribes of low culture who are in this way brought into close relation with remote ages, and a certain unity imparted to the general process of the physical and mental evolution of man. In this connection the treatment of Dubois' *Pithecanthropus erectus*, frankly accepted as Darwin's, "missing link," of the Neanderthal skull, of the Cro-Magnon race and of other prehistoric remains, is highly instructive, and presents the monogenist doctrine of human origins in a way that the Polygenists will find it difficult to answer.

Less satisfactory is the discussion of the vexed question of Aryan origins which with so many recent German writers are sought, not in Asia, or even in Eurasia, but in the Baltic lands, and more particularly in South Sweden. For this northern cradle support is still sought in strained etymologies, such as *south* from the *Sound*, *eel* made cognate with *anguilla*, which Kluge tells us is impossible, *Ruotsi* with *Ruderer*, and so on. The claims of the proto-Germans to be the original dolmen-builders is, of course, re-affirmed, no notice being taken of Sergi's North African theory; while the tremendous difficulty of the late, relatively quite modern, position of the Teutonic branch of the Aryan mother-tongue is not even mentioned.

The work is splendidly illustrated with as many as 557 cuts of all kinds and

two maps; but a strong protest must be entered against the way it has been turned out by the publishers. It is printed in the old eye-straining black-letter type, and so loosely stitched together that it falls to pieces at the first handling. There is an index of little use, and an "Inhalt" of a few quite short headings has to do duty for chapters or a proper table of contents, so that the search for entries is irritating and often hopeless.

A. H. KEANE.

COLONIZATION.

'De la Colonisation chez les Peuples Modernes.' By Paul Leroy-Beaulieu. Sixth edition, revised and augmented. 2 vols. Paris: Félix Alcan. 1908. *Price* 20 *fr.*

A work dealing with the history and problems of modern colonial policy is no sooner published than it is out of date. The revisions to which M. Leroy-Beaulieu has subjected his original book are evidence of his determination to keep abreast of current movements as far as possible. The present edition is an accurate index to the more important changes in the colonial problems of the world and the new points of interest developed between 1902 and 1907.

Apart from minor changes of phrase and figures, inevitable in any careful revision, the important new matter is restricted to Africa and the Pacific. Among international problems the position in Morocco naturally receives careful treatment, while recent events in connection with the Congo are discussed at some length. Of more strictly national interest are the new sections on the position of France in Algeria, with special reference to the race question, the aftermath of the war in South Africa, the new problems involved in the relationship of the British colonies with the mother country, and the financial conditions of the German colonies.

In the Pacific region space is devoted to the new question raised by the policy of Japan on the mainland of Asia, and to the position of the island groups, more particularly the Dutch possessions, with regard to the future distribution of world power. Statistics have been brought up to date throughout, and frequent comparisons by the author with earlier editions are of interest as showing the accuracy of his forecasts in the light of subsequent events.

A. J. S.

SHORT NOTICES.

Europe.—'Corsica.' By John Mitchell Chapman. (London: Stanford. 1908. Pp. xii., 380. [*Map and Illustrations.* 7*s.* 6*d.*) The few who visit Corsica generally return enthusiastic over its charms, and the author, whose book is the outcome of many visits, is no exception. His narrative and descriptions are thoroughly interesting, and the book obtains distinction in its class because it gives a certain amount of topographical and economic information on more formal lines than usual, and therefore valuable for reference.

'Valladolid, Oviedo, Segovia, Zamora, Avila, and Zaragoza.' By A. F. Calvert. (London: Lane. 1908. Pp. xxiii., 162, and 413. *Plates.* 3*s.* 6*d.*) This is a volume of the "Spanish Series" edited by Mr. Calvert, a series justly noted for its excellent quality, considering its low price. Each volume is, of course, principally devoted to illustrations, which are from photographs, and mainly of architectural subjects, though studies of costume, etc., are also included. The photographs are excellent (in this volume even better than in others of the series which we have seen), and the text, aiming at little beyond the necessary statement of fact to accompany the illustrations, is nevertheless never dull, and serves its purpose well.

'Guide to the Walks and Climbs round Arolla.' Collected and written by

W. Larden. (London: S. Chick. 1908. Pp. x., 138, and 18 blank. *Illustrations*, 2*s.* 6*d.*) This is a guide of unusual plan, inasmuch as it is simply an annotated reprint of the mountaineering notes in a visitor's book at a well-known climbing centre. But in as far as the work of climbers involves the minutest topographical knowledge, which is so frequently in the nature of actual discovery, a book of this sort must be valuable, not to climbers only, but to any one who wishes to study a mountain district in close detail. And these notes make by no means uninteresting reading.

'En Route.' By Roy Trevor. (London: Stanford. 1908. Pp. xv., 304. *Maps and Illustrations.* 10*s.* 6*d. net.*) This book will interest travellers by motor-car, especially those who intend to brave the difficulties of the Alpine passes. The reader is also taken for a brief journey into Italy, and into Spain. The photographs are very good, the maps unsatisfactory.

'The "Contour" Road-book of Ireland.' By H. R. G. Inglis. (Edinburgh: Gall & Inglis. 1908. Pp. xvi., 256, 16. *Maps and Illustrations.* 2*s. net.*) The character of these valuable road-books, wherein the slope of all the main and secondary roads is shown in section, is so well known that detailed description is unnecessary. In other volumes we have sometimes found that the steepest gradient of a hill is much understated, perhaps owing to the average gradient from foot to summit having been estimated. From the claim that the present volume is compiled from special surveys, it may be inferred that this fault has been eliminated. In any case, all road-users acknowledge the utility of the series.

Asia.—'From Edinburgh to India and Burmah.' By W. G. Burn Murdoch. (London: Routledge [*n.d.*] Pp. xiii. and 403. *Illustrations.* 10*s.* 6*d. net.*) This is simply the narrative of a journey along well-known lines, but it is written in a style so fresh and with an individuality generally so pleasant that it is thoroughly entertaining; only occasionally its naïve tone suggests a certain affectation. The word-painting of scenes in city and country, familiar or unfamiliar, experiences of travel in a variety of methods, sport, and innumerable other subjects are arranged, so to say, kaleidoscopically. The coloured illustrations, ranging in subject from Piccadilly Circus to the Irawadi, are mainly by the author; they may therefore be expected to add to the attraction of the volume, and they do so.

'In Korea with Marquis Ito.' By George Trumbull Ladd. (London: Longmans, Green & Co. 1908. Pp. xiii. and 477. *Illustrations.* 12*s.* 6*d. net.*) The writer had special facilities for observing the condition of affairs in Korea. He was under Japanese guidance, and had therefore every inducement to partisanship in matters which are yet far from raised above the level of subjection to divergent criticism. But so far as is reasonably to be expected, he writes impartially of Japanese work in Korea. To his study of this work a first part of the book, entitled "A Narrative of Personal Experiences," forms a lengthy preface. His travels took him to Seoul, Pyeng-yang, Chemulpho, and other places, and at every moment of the journey he shows himself to have been a close observer, and an admirable general idea of Korea and Korean life is to be gathered by reading this preliminary section of 176 pages.

Africa.—'Tramps Round the Mountains of the Moon.' By T. Broadwood Johnson. (London: Fisher Unwin. 1908. Pp. xxiii., 316. *Illustrations.* 6*s.*) We have here a book of the most varied personal experiences, by one who has wandered far afield in the course of missionary work. There is first a historical retrospect, giving a succinct account of the principal incidents in the region under notice since the days of Stanley. The interest of the writer's own narrative is perhaps greatest when it also, as in many parts, is retrospective, contrasting the condition of the country and its inhabitants at present and a few years back. The

author has also something to tell of affairs in the eastern part of the Congo State. The book is well illustrated.

General.—'A Mariner of England.' Edited by Colonel Spencer Childers. (London: Murray. 1908. Pp. xiii., 317. 10s. 6d.) We have here "an account of the career of William Richardson from cabin boy in the Merchant Service to warrant officer in the Royal Navy [1780 to 1819] as told by himself." This is a work of rare character—as the editor observes, "a picture at first hand, and from the point of view of an ordinary seaman of life in the navy and merchant service during the great period." It is remarkably well written, obviously free from exaggeration or any attempt at high effect; it reads, in fact, not unlike a boy's book of sea-adventures, with the stamp of truth upon it. The descriptions of places and native customs are made specially interesting by the writer's peculiar point of view.

THE MONTHLY RECORD.

EUROPE.

The Tidal Wave of the Adriatic.—Major-General Robert von Sterneck, who is well known for his pendulum apparatus for the measurement of the deviations of the plumb-line, has instituted investigations into the progress and the magnitude of the tidal wave at thirty-three coastal and insular stations of the Adriatic sea. These inquiries are not without practical and more general interest. The first investigations of the kind in the Adriatic were carried out on the side of Austria in the years 1869 and 1870. The Adriatic Commission of the Vienna Academy of Sciences then determined the times of high water at new and full moon at the harbours of Trieste, Pola, Fiume, Zara, Lesina, and Corfu. On the basis of these few actual observations the times at many other places were simply calculated, and so entered as definite facts in nautical charts, plans, etc. Such interpolated figures have on occasion been proved to be inaccurate. Their correction is the first result of the new Sterneck investigations. The general results, however, are as follows: from the point of view of tide, the Adriatic falls into two different parts—a northern and a southern, the line of division running between Mount Gargano on the Italian, and Ragusa on the Austrian side. Of the southern part no more can at present be said with certainty than that its tides run differently from those of the northern part. In the Northern Adriatic the tidal wave sets in with an establishment * of 4 hours along the Dalmatian coast, and proceeds north, washes the peninsula of Istria, reaches Venice, and, advancing in a southerly direction by the Italian coast, passes Ancona approximately with an establishment of zero, and again reaches the border line of the two divisions with one of 4 hours. Here it unites with the counter-tide coming from the southern part. In 12·4 hours the tidal wave makes the circuit of the coast of the Northern Adriatic. The velocity of its propagation is unequal. In the south and in the north of the Northern Adriatic, on the Dalmatian as on the Italian side, it is great, amounting to 190–195 miles an hour. In the middle, between Ancona and San Benedetto, the velocity is least, falling to only 30 miles an hour, and at the corresponding point in Dalmatia to as low as 15 miles an hour. Shallow and narrow channels, such as are found at Zara, delay the progress of the tidal wave, so that it forces its way into the channel from both sides. As the velocity, so also the magnitude of the tide diminishes from the north and south towards the middle,

* This is equivalent to the interval between the moon's transit and the arrival of the flood-wave (the "lunitidal interval") at new or full moon.

where it reaches a minimum of 7½ inches. The average magnitude amounts to 11½ inches. On the western coast of Istria, in Rovigno and Pirano, as also in Grado, the well-known watering-place to the west of Trieste, it reaches its maximum of from 24 to 39 inches. In the south the daily inequality is nearly normal. In the latitude of Zara it increases towards the Quarnero with its many islands, and at certain stations becomes so great that one of the two tides seems almost suppressed. It then seems as though there were but one tide of 24 hours. The cause of these great inequalities may be set down in greatest part to interference phenomena, formed by the unequally rapid confluence of the water from different sides of the islands. The circular movement in the Northern Adriatic may be conceived as an oscillation of 12·4 hours' duration, accomplished about two nodal lines with a phase-difference of two hours, intersecting about 25 miles east and 9 miles north of Ancona. At this point, accordingly, no tides are perceived.

ASIA.

Mr. G. W. Bury's Proposed Expedition in South Arabia.—Mr. G. W. Bury, who has had much experience of travel in South-West Arabia, has just undertaken a more extensive expedition than any that he has yet carried out, in the hope of eventually making his way into the unknown interior. He proposes to land somewhere east of Aden, and proceed *viâ* the Yeshbum valley and Nisab to Behan al Jezab, and thence to Harib and Mareb, examining *en route* some of the ruined or buried cities (such as Shabwa, north of Nisab), and possibly waiting at one or other of the places mentioned for a favourable season for a further advance. From Mareb, where he will try to obtain copies of the inscriptions to be found there, Mr. Bury hopes to move northward along, or in touch with, the caravan route to Riadh, if such a route still exists and water is procurable, making occasional journeys eastward into the desert. If it should be possible to reach Aflaj *viâ* Wadi Dawasir, he will endeavour to traverse the Yabrin district, keeping on northwards towards Hautha—a route which should enable him to strike the supposed Oman-Mecca pilgrim route, if it has any real existence. If successful in this, and the route seemed practicable, he would make for Muskat. Otherwise he would choose one of various courses which would lead him either north to the Persian gulf, west (from Riadh) to the Red sea, or south to the Hadramaut. Mr. Bury's acquaintance with Southern Arabia dates from 1896, between which year and 1903 he was engaged in various expeditions of antiquarian or zoological research, including the Austrian expedition of the Vienna Academy of Sciences. Besides speaking Arabic, he has acquired a knowledge of some of the local dialects, having lived on intimate terms with the desert clans. His new expedition (for the purposes of which he has had some instruction in surveying at the Society) is supported by a grant from the Council, and he will be accompanied by Mr. P. E. L. Gethin, who has taken the Society's diploma, and is contributing to the expenses of the expedition.

New Expedition of Prof. Ellsworth Huntington.—Prof. Huntington sends us some notes respecting the new expedition to Western Asia, which he proposes to undertake early in the present year. He hopes to leave New York on February 13 and proceed to his first objective—the Dead sea—with as little delay as possible. He will make as careful a study of that sea as time will allow, in order to determine exactly what fluctuations it has suffered, and also to decide whether such fluctuations (of the occurrence of which evidence already exists) took place entirely before the human period, or in part within the same. The next object of study will be the Syrian desert, whence Prof. Huntington will proceed north-westward to the basin region of central Asia Minor, afterwards going east to lakes Van and

Urmia. His purpose is less exploration than the observation of the relation of the people to their environment, and the collection of evidence of any physical changes which the country may have suffered during historic times.

Dr. T. Longstaff's New Expedition to the Himalayas.—Dr. Longstaff informs us that he hopes to do some further work in the North-West Himalayas in the summer of this year. He proposes to make his way to the Saltoro glacier system in the Karakoram range, and if possible to cross the long-closed Saltoro pass to the headwaters of the Oprang river (a branch of the Upper Yarkand river). The only traveller who appears to have visited those headstreams is Sir F. Younghusband, who tried the Saltoro pass from this direction in 1889, but did not cross it. There is, in fact, Dr. Longstaff points out, no record of any crossing of the main Karakoram range between the Mustagh and Karakoram passes (the latter of which is probably not on the Karakoram range at all). We have no knowledge of the mountains north-east of K_2, and it is just here, as pointed out by Colonel Burrard, in the recently issued monograph on the Himalayas (p. 100), that the great undiscovered peaks are most likely to exist. While, therefore, Dr. Longstaff will make an effort to climb any promising peak that offers, he attaches still greater importance to the acquisition of some knowledge of the country across the main range. His original plan was to go up the Nubra valley and follow up the Saichar glacier, partially explored by Henry Strachey in 1848; but he abandoned this idea on hearing that Dr. Neve of Srinagar is planning an expedition there during the present year. Dr. Longstaff will be accompanied by Lieut. Morris Slingsby, 50th Rifles (Frontier Force).

Meteorological Research in India.—The Annual Report for 1906–7 of the Board of Scientific Advice for India contains, as usual, a number of interesting summaries of progress in the various scientific departments with which the Board is concerned. The reports on meteorology and geodesy are those which have most interest for the geographer. The former discusses *inter alia* the researches lately made into the connection between meteorological conditions in various parts of the world in the period preceding the Indian monsoon, and the amount of rainfall therein to be expected. A study of the statistics at present available seems to show that the conditions most closely associated with abundant monsoon rains are: low pressure at Mauritius in the preceding May, high pressure in the Argentine and Chile in the period March to May, deficient sub-equatorial rainfall in May as given by Zanzibar and the Seychelles, deficient snowfall in May, and high pressure in India during the previous year. A formula has been worked out for calculating the monsoon rainfall departures, and on applying this to successive years from 1875 onwards it is found that, of the years with a forecasted departure of more than one inch, the sign of the departure has been correctly estimated in twenty cases out of twenty-four. An important relationship seems to be established between pressure at Mauritius and the position of the trough of low pressure in Upper India in June, July, and August. The report also refers to results of investigations of the upper air by means of kites. On July 17, 1907, the highest kite ascent yet made in India (12,000 feet) was effected at Belgaum with good results, but soon afterwards the conditions became prohibitive of further attempts. The dry layer which had sometimes been found to occur in 1906 at heights between 2500 and 8300 feet was found once only in 1907, at a height of about 5000 feet. Kite-flying during the monsoon has proved more difficult than had been anticipated, and work with sounding balloons has also to encounter obstacles. It has shown, however, that though there is always a large westerly component in the upper air-current above Simla, it is not so constant either in direction or velocity as might have been imagined. We hope to speak later of the geodetic summary.

Captain D'Ollone on the Eastern Tibetan Frontier.—Further information about Captain D'Ollone's expedition on the Chino-Tibetan frontier has lately been received in France. A first instalment is contained in a letter to the *Comité de l'Asie française*, from the remote mountain village of Sun-pan-ting, in the extreme north-west of the province of Sechuan. The captain says that, while he himself had traversed the country of the Lolos, his friends, de Fleurelle and Lepage, had explored that of the Miao-tze, both independent tribes. From the month of December to February 15 they were scarcely ever free from snow. They then visited the country of the Sifan or barbarians, in the valley of the Min, and were then preparing to cross the Tsaoti or steppe country, north-west of Sung-pan-ting. Captain D'Ollone hoped to visit, first of all, the bend of the Hoang Ho, north-west of the Sung-pan-ting, which had been reconnoitred by Tafel in September, 1907, and thence to reach the great lamasery of Labrang and Ho-chou by a new route. The Chinese authorities were raising great difficulties. A later communication, sent from Lan-chou to the Paris Geographical Society and printed in *La Géographie* for November, 1908 (with sketch-map), gives an interesting account of the journey across the wild tract intervening between Sun-pan-ting and Lan-chou, during which, by avoiding as far as possible the routes of previous travellers, Captain D'Ollone was able to secure some valuable results.* Having followed down the valley of the Eul-tao Hwang-ho ("second Hwang-ho") to its junction with the main river, he was able to fix the position of that point, and also to throw further light on the strange bend of the Hwang-ho in this region, which was in part laid down by Dr. Tafel. Keeping along its valley for some days in a north-westerly direction (it was here on its return course to the west after having passed the meridian of 102° on its easterly course), and then striking north-east for Lan-Chou, Captain D'Ollone proved the existence in this district of a small enclave of Mongols living in the midst of the Tibetans, and also gained an insight into the political and religious condition of the country, which abounds with monasteries subordinate to the great lamasery of Labrang, although the people in general display an independent and warlike bearing. The lamas here belong to the yellow sect. In its physical character this region is said to differ entirely from the more typical parts of Tibet. It lies at an altitude of 13,000 feet, and forms a plain traversed by mountainous swells of no great height, covered with grass, and everywhere passable by horses. It is inhabited by a pastoral people who live on horseback. Captain D'Ollone says that they approach the Aryan type, and might well be known by the name Sifan given them by the Chinese, since they are neither Tibetans (in spite of their language) nor Mongols (in spite of their habits). The traveller and his companions encountered hostilities in this country, which came near ending in disaster to the expedition. It, however, eventually reached the Labrang monastery, which is described as much surpassing the better-known one at Kumbum. A careful survey of the route was carried out by Lieut. de Fleurelle, whose astronomical observations shift Sun-pan-ting about 7′ northwards. A large number of photographs were also secured. Captain D'Ollone has since successfully effected a junction with M. Pelliot's expedition.

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* Besides Dr. Tafel, Captain D'Ollone speaks of two English travellers as having crossed this tract ten years ago, and identifies one as Captain Pottinger, whom he speaks of as having been afterwards killed in Shensi. He would seem to be confusing this traveller with Captain Watts-Jones, who crossed the region in question in company with Mr. Birch, and afterwards fell a victim to the Boxers (see review of Mr. Birch's posthumous work in *Geographical Journal*, vol. 21, p. 64).

AFRICA.

Lieut. Boyd Alexander's New Expedition to West Africa.—Lieut. Boyd Alexander left England on December 12, 1908, with the object of thoroughly exploring the islands of São Thomé, Principe, and Annobon, chiefly from a zoological point of view. In this work he will once more have the assistance of his collector, José Lopes. In 1901 Lieut. Alexander carefully explored the zoology of Fernando Po, the largest of the row of islands in the Gulf of Guinea, and showed that it possessed a rich and varied fauna, closely allied to that of the mainland, of which it therefore seems to have once formed part. By his work on the other islands he hopes to throw some light on their possible past relations with the continent. After a stay of some four months in these islands the expedition will cross over to Victoria in the Kamerun, with the object of carrying out a thorough zoological exploration of the Kamerun mountain, where Lieut. Alexander considers it possible that he may meet with forms closely allied to those of the Ruwenzori range. He hopes to examine also the interesting Manenguba range further in the interior (cf. *Journal*, vol. **32**, p. 530), which rises to a height of some 10,000 feet. Ethnology and photography will form part of the work of the expedition, which will probably be absent about twelve months.

French Operations in the Central Sudan.—Important events are reported as having taken place during 1908 in the French sphere in the Central Sudan, to the east and south-east of Lake Chad. According to a note in the November number of the *Revue Française* (p. 679), a visit to Sultan Snussi at Ndelle was made early in the year by Captain Mangin, who secured the execution of a treaty more favourable to France than that of 1903. Among its provisions are, the entire abolition of the slave trade, and the gradual introduction of French administrative methods. In Wadai, military operations of some importance have taken place, beginning with a successful pursuit of a band of raiders by Lieut. Tourenq, commandant of the French post of Bir-el-Kala (Lake Iro) and culminating in the total rout, by Captain Jérusalémy, of a Wadai army which had been sent against the French posts on the Shari. A successful attack on a Wadai force was also made by Captain Ferrandi at Arada, a point on the caravan route from Abeshe to Kufra and Benghazi. Some account is also given (in *La Géographie*, October, 1908) of a military expedition carried out in 1906 under Captain Bordeaux, which, starting from a point on the Bahr-el-Ghazal (the old river-bed entering the south-eastern angle of Lake Chad), approached within a short distance of Abeshe; as well as of a further expedition, in 1907, to Borku and Endi, by which the geographical results obtained by Captain Mangin (*Journal*, vol. **29**, p. 569) were considerably extended. We hope to recur to this in a subsequent number.

Colonel Chaillé-Long's Work in the Sudan.—Sir Harry Johnston, who is now on a visit to the United States, sends us some notes on an interview which he has had with Colonel Chaillé-Long, well known as one of Gordon's lieutenants during his first governorship of the Egyptian Sudan. The colonel, whose great-great-grandfather was a Frenchman, is described as recalling, by his aristocratic appearance, some old French marquis of the *ancien régime*, and the impression is heightened by the fact that he speaks French with the exact accent and mannerisms of Paris. It will be remembered that he has frequently complained that his services to African geography have not met with due recognition, and especially that the name (Ibrahim) bestowed by him on Lake Kioga, the expansion of the Victoria Nile, has not been adopted by geographers. It was, however, employed by Mr. Ravenstein in his map of East Africa, compiled for our Society, and it was decided by the Council only a year ago to use the name as an alternative to Kioga.

Politically, Colonel Chaillé-Long is best known for his mission to King Mtesa of Uganda, entrusted to him by General Gordon, who was ambitious of incorporating this kingdom in the Egyptian dominions. According to the colonel, it was the opposition of Lord Cromer (then Sir Evelyn Baring), and in a less degree of General Stanton and Sir John Kirk (on behalf of Great Britain), which frustrated this design. The colonel was also sent by Gordon on an expedition to the East Coast of Africa for the purpose of widely extending Egyptian sovereignty in this direction, but here too the action of Sir John Kirk led to the curtailment of the scheme. Colonel Long is now compiling his memoirs, which, Sir Harry Johnston says, promise to throw a good deal of new light on Gordon's *régime* in the Sudan.

Ascent of Kinangop, British East Africa.—A recent ascent to the summit of this peak by the Italian padres of the Industrial Mission station in Kikuyu is described in the *Bollettino* of the Italian Geographical Society, 1908, Nos. 7 and 8. The mountain in question is that first mentioned as Kinangop by Joseph Thomson, who placed it at the southern extremity of the Aberdare range, to which it is also assigned by the Italian missionaries, though some travellers have been disposed to give it a more independent standing. The correctness of the name Kinangop has also been questioned, and among the various names assigned to it are Donyo Ronyu, Doinyo Ngushei,* and Nandarua, which last is also employed (under the form Niandoroa) by the padres, who do not make it clear whether they heard the name Kinangop in use in the country itself. They assign to it an altitude of 4500 metres (14,769 feet), which is greatly in excess of that determined by Captain G. E. Smith —viz. 12,920, as recorded in that officer's paper in the *Journal* for September, 1899. Their observations can hardly, however, have been such as to justify confidence in the accuracy of the higher figure. The special object of the ascent—the erection of a monument to the patron saint of the mission on the summit of the mountain—need not be dwelt upon here, but a few details of geographical interest are to be gleaned from the somewhat high-flown description of the padres. Although the route on the south side of the mountain would have been the more direct, they chose a more northerly one as less obstructed by forest than the former. This led them up the valley of the Masioia, which takes its rise on the mountain. The first camp was pitched near the village of the chief Vangioj, whence towards evening a magnificent view of Kenya was obtained. On the second day the forest was entered, but at a height of 2800 metres the bamboos became shorter. Many fresh traces of elephants were still seen here. Before reaching camp a storm of wind and rain was encountered, and at nightfall the temperature sank to freezing. On the third day, after passing through a fine coniferous forest, the travellers found that the arboreal vegetation gradually ceased at about 3500 metres, grass and herbaceous plants, with many flowers, taking its place. At the next camp the ill-clad natives found it difficult to shelter themselves from the cold, and ice was found in the vessels in the morning. The ascent to the highest of the precipitous peaks which crown the summit was effected on the fourth day, the level space at the top measuring only some 10 feet by 6 feet. Torrents of rain rendered the night a comfortless one, but the descent was successfully accomplished in less than two days. The nature of the upper region is well shown by the photographs which accompany the article.

AMERICA.

Coronado's Route through Northern Mexico and Arizona.—This vexed question has once more been raised in the *Bulletin* of the American Geographical Society (vol. 40, No. 5), by Mr. Samuel Potter, who brings to its consideration a close

* See *Journal*, vol. 25, p. 295.

personal knowledge of much of the country traversed by the early Spanish adventurer. The special point to which attention is directed is the location of the place called Chichilticalli ("Red-house" in Aztec), by the historians of the expedition, which had been the terminus of the previous expeditions of Friar Marcos de Niza and Captain Melchior Diaz (1539), but incidentally the general line of route from Culiacan on the Gulf of California is also discussed. The statements of the chroniclers are so vague that certainty in the matter can never be attained, and commentators have differed widely in their interpretation.* Mr. Potter agrees with most of his predecessors that Cibola is to be identified with the villages of the Zuni Indians, but he brings the expedition to this point by a somewhat different route to any former writer. He lays stress on the fact that Castañeda (on a solitary statement by whom Mr. Dellenbaugh based the greater part of his argument) wrote his account twenty years after the events, and that as he was not present when Coronado reached Chichilticalli, little reliance can be placed on what he says about that place. Jaramillo, who was with Coronado, makes no mention of a house or a ruin, such as was spoken of by Castañeda. Mr. Potter considers that the first part of the route from Culiacan ran parallel to the coast-line and as near to it as was practicable for travel. From the valley of Señora (corrupted in later times to Sonora) it probably struck into that of the Santa Cruz, which would agree well with the large and fertile valley of Friar Marcos, and would be the Nexpa of the chroniclers. In regard to Chichilticalli, which has often been identified with the Casa Grande in the valley of the Gila river, the writer shows that before reaching it the expedition had left the inhabited region and entered the difficult wilderness of mountains in which the thorny vegetation had given place to pine forests. These considerations point to a position in the valley of the Salt river in about 110° W. to which various Indian trails lead across the mountains north of the Gila. Directly in front, as the traveller approaches this valley from the south, is seen the broad summit of the Sierra Ancha, its extremity projecting as a great dyke of red rock resembling a castellated "red house." This, Mr. Potter thinks, may have given rise to the appellation given to the locality by the native camp-followers.

International Boundaries in South America.—In spite of the settlement of a considerable number of South American boundary questions within recent years, a good many are still in dispute, though some progress is apparently being made towards a settlement of some of them. The long-standing question between Brazil and Colombia was brought a stage nearer a final solution by an agreement signed on April 24, 1907, which traced a definite frontier from Cucuhy (Cocuy) on the Rio Negro (the point of termination of the common frontier of Brazil and Venezuela) to the confluence of the Apaporis with the Yapura. The text of the treaty was printed at Bogota early in the present year, and is summarized in the June number of *La Géographie*. Beyond the last-mentioned point the claims of Ecuador and Peru (as against Colombia) have to be considered, and the further settlement of the Brazilian frontier is postponed until the three other states reach an agreement. A treaty between Colombia and Peru, also ratified on April 24, 1907, submitted the question of the boundary between these two countries to the arbitration of the Pope or of some personage named by him. It is to be effective, however, only in case the territory in dispute is adjudged to Peru, as against Ecuador, in the arbitration before the King of Spain. Boundary agreements have been concluded by Brazil with Dutch Guiana, Venezuela, and Uruguay,

* The last serious attempts to solve the question were that of Mr. Winship in his edition of Coronado's expedition (see *Journal*, vol. 11, p. 71), and Mr. Dellenbaugh (*ibid.*, p. 552).

while negotiations have been in progress between Brazil and Peru regarding the territory lying between the source of the Yavari and 11° S. A large portion of this was recognized as Brazilian by the treaty with Bolivia in 1903, but Peru has never acquiesced in that arrangement. Peru has also to come to an arrangement with Bolivia regarding the frontier south of 11°, and this question was some time ago submitted to the arbitration of Argentina. The arguments and counter-arguments on the two sides have been presented to the arbitrator, and have been summarized in the *Boletin* of the Ministry of Foreign Affairs at Lima (No. 25, 1908). By a treaty signed in 1907, the President of the Argentine republic was also named arbitrator in the dispute between Bolivia and Paraguay relative to the ownership of the Chaco, which, formerly at issue between Paraguay and Argentina, was adjudged to the former by the award of President Hayes in 1878.

AUSTRALASIA AND PACIFIC ISLANDS.

Expedition in British New Guinea.—An exploring expedition of some importance has started up the Purari river (which enters the Gulf of Papua a little east of 145°) with the intention of reaching its headwaters, and, if possible, making its way overland to those of the Fly river. The project is an ambitious one, and from the latest accounts received in Australia (printed in the *Sydney Morning Herald* of November 7 last) the obstacles encountered seem such as to render its realization extremely doubtful. The leader of the expedition is Mr. Donald Mackay, who wrote from a spot 2 miles above Baroie village on the upper Purari, 140 miles from the coast, and a mile beyond the highest point reached by Sir W. Macgregor. The chief difficulties had arisen from the failure to obtain supplies of sago for the porters (the above-mentioned village having been deserted by the inhabitants), and from the rapidity of the current of the Purari, which, being in flood, ran at the rate of 7 miles an hour and swept back the boats like straws, even though twelve oars and fourteen paddles were kept going. The absence of inhabitants had made it impossible to obtain information as to the character of the country ahead, though to all appearance it was very rough and mountainous. Mr. Mackay proposed to send out parties in search of a passable track, and of sago, without which it would be quite impossible to reach the Fly river. In any case it was hoped to do some work in a north-westerly direction, possibly returning by another of the many rivers that empty themselves into the Gulf of Papua.

Proposed Expedition in Dutch New Guinea.—A scheme has been set on foot, chiefly on the initiative of Mr. Ogilvie Grant, of the Natural History Museum, and in connection with the jubilee of the British Ornithologists' Union lately celebrated, for the despatch of an expedition into the almost unknown interior of Dutch New Guinea. The objects are primarily ornithological and zoological, but it is hoped that other branches of science will also be represented among the members of the party, and we believe that, if possible, arrangements will be made whereby the excellent opportunity thus offered for survey work in this virgin field will be utilized. It is pointed out by those responsible for the inception of the scheme that the interior of Dutch New Guinea, especially the great range which traverses it from east to west, and of which the highest summits are capped with snow, is a land of unlimited promise to the collector, particularly (to judge from the many singular forms already brought to light from other parts of the island) in respect of ornithology. It will be remembered that various attempts have lately been made by the Dutch to explore the snowy range, and that the latest expedition sent for that purpose—that of Dr. Lorentz—met with some measure of success (*Journal*, vol. 31, p. 447). It is hoped that the amicable understanding with the natives established by the Dutch authorities may facilitate the proposed exploration, and it

is stated that specially favourable transport arrangements have been made by Mr. Walter Goodfellow, who has already carried out several expeditions to New Guinea, and who will undertake the leadership of the party. It is proposed that the expedition should leave England about June, 1909.

POLAR REGIONS.

Captain Bénard's Arctic Expedition.—The November number of the *Revue Française* contains, at p. 674, some particulars of the first season's work of Captain Bénard's Arctic Expedition, which left Dunkirk on April 12, 1908, for the region around Novaya Zemlya (*Journal*, vol. 31, p. 223). The *Jacques Cartier* arrived at Archangelsk at the end of September, after experiencing stormy weather towards the end of the summer, which had done some damage to the ship and tasked all the energies of the crew. Good results are, however, reported to have been achieved. Work was carried on on both sides of Novaya Zemlya, especially in Kostin and Matochkin shars, information being obtained as to the prospects of a fishery in those seas, and many specimens of the local fauna obtained. An examination of the driftwood on the coasts of Novaya Zemlya, with a view to determine its place of origin, has shed some light on the *régime* of the currents in the adjacent seas. The bulk of the expedition is wintering at Archangelsk, though the health of one or two of its members has compelled them to relinquish further participation in it.

Mr. Shackleton's Expedition.—News from Lyttelton, New Zealand, is to the effect that the *Nimrod* left that port early in December, in order to open up communication with Mr. Shackleton and his companions, who have now been isolated from the rest of the world over ten months (see *Journal*, vol. 31, p. 448). It is hoped that the *Nimrod* will reach her destination in about six weeks, and may be able to begin the return voyage before the end of next month.

The French Antarctic Expedition.—We have received the following communication from Dr. Charcot, dated "A Bord du 'Pourquoi Pas?' Buenos Aires, November 4, 1908:" "Though we have had a good deal of bad weather, in fact a gale nearly once a week, we have crossed over from France rather quickly, and I am extremely satisfied with the ship, a good and strong sea-boat all over. The engines have been working in a very satisfactory way at an average speed of 7·5 knots. We stopped four days in Madeira, one at Cape Verde islands, once at Itacolumi, a coral *récif* on the coast of Brazil, where we did some biological work, a week at Rio Janeiro, and here we are at Buenos Aires for a fortnight. At Rio Janeiro we had a welcome and generous reception, the Brazilian Government giving us a hundred tons of coal and everything we could ask for. Here at Buenos Aires they are still more generous, if possible, and everything is absolutely open to us. The ship is in dry dock entirely overhauled by the Government engineers, and all necessary modifications freely made for us. It is certainly impossible to find more generous interest. End of November I expect to be at Sandy Point, where we shall take in our coal sent from France, and different things. I hope to be working in the Antarctic in December. Everything is going on splendidly on board until now. My wife has proved a good sailor, and is coming with us as far as Sandy Point, and sails back to France on board one of the Pacific line steamers. It is with the greatest pleasure I shall write a line to you each time I can, and you will just take what you consider as worth publishing."

GENERAL.

The New Travel Magazine.—At the moment of going to press we have received the first number of the new monthly magazine alluded to in our last

number (p. 628), and find our expectations as to the value of the new venture fully borne out by the attractive get-up, and varied and interesting contents, of the magazine. The number opens with a stirring "Call to Exploration" by Sir Clements Markham, which derives a special interest from the allusions to the writer's own career which it contains. Other papers deal with the Danish East Greenland Expedition and travel in the Balkans, Peru, New Guinea, and elsewhere. The editor is Mr. S. C. Gilmour, who is exceptionally qualified for the task by the assiduity with which he has kept himself *au courant* with modern exploration in Africa and elsewhere.

Mr. Chisholm on the Definition of Geography.—Mr. G. G. Chisholm delivered his inaugural address as Lecturer on Geography in the University of Edinburgh on October 6, and it is published in the November number of the *Scottish Geographical Magazine*. Taking as his subject "The Meaning and Scope of Geography," Mr. Chisholm dealt at considerable length with the definition of Geography, discussing, in particular, the definitions which have been proposed with the view of presenting geography as a science with a single aim. He considers first what he takes as three definitions put forward by Dr. H. R. Mill in 1899, 1901, and 1902—the first, "The exact and organized knowledge of the distribution of phenomena on the surface of the Earth, culminating in the explanation of the interaction of Man with his terrestrial environment;" the second, "The science which deals with the forms of relief of the Earth's crust, and with the influence which these forms exercise on the distribution of all other phenomena;" and the third is the same as the first, with the omission of the clause commencing "culminating." Mr Chisholm finds these definitions in need of further explanation, and Dr. Mill's explanatory statement that "the distinctive task of geography as a science is to investigate the control exercised by the crust-forms directly and indirectly upon the various mobile distributions" is criticized on the ground that the word "mobile" cannot be recognized as helping to distinguish the task of the geographer. Possibly the explanation would have been more explicit had it run "the control exercised by immobile distributions upon mobile distributions," *i.e.* by fixed forms upon forms capable of movement or of modification which produces effects equivalent to movement. Mr. Chisholm may possibly not have recognized that this point of view is that from which the world is looked upon as a going machine, the static and dynamic relations being contrasted and their interrelation explained. He goes on to consider Prof. Hettner's more recent definition, which views geography as "the science of the arrangement of things in space on the Earth; or, seeing that we do not know the interior of the Earth, we may at once say, on the surface of the Earth." This, he says, is elucidated by the further statement that "a fact is geographical when, and only when, and in so far as, it shows local differences, and when and in so far as these local differences stand in connection as causes or effects with the local differences of other sets of phenomena." This definition, in the light of the explanation quoted, Mr. Chisholm is inclined to accept as essentially equivalent to one put forward by himself in the R.G.S. syllabuses of instruction in geography, which, with the addition of one word (given in square brackets) runs: "Geography has three main functions, (1) the determination or ascertainment, (2) the expression, and (3) the estimation or valuation of [terrestrial] local conditions and place relations, that estimation or valuation having reference to the degree and extent of the influence which given local conditions and place relations exercise on other distributions." In order to bring his definition more into line with Prof. Hettner's, Mr. Chisholm gives it a new form as follows: "It is the function of geography, with respect to any class of phenomena that have a local distribution, to explain that distribution in so far as it can be explained by

variations connected with place in the operation of causes whose operation varies according to locality or according to the relation of one locality to another;" and in order to narrow the field, the whole of which he recognizes as geographical, but which is too vast to be profitably cultivated by one specialist, he adds, "especially on human distribution, and hence on the life of man generally." Mr. Chisholm combats the view of Profs. Davis and Penck that biogeography and not anthropogeography ought to be set alongside of physical geography, and he announces that the geography which he proposes to teach is anthropogeography. The relations between geology and anthropogeography are, he points out, threefold: (1) the surface conditions, mainly of soil, which are helpful to man or the reverse; (2) the history of geological process as throwing light on present geographical distributions; and (3) the most intimate relationship that the causes now operating to affect the value to man of local conditions are the same as those which have played the chief part in geological history. Mr. Chisholm concludes, "But these illustrations of the duty of the geographer may perhaps give rise to the objection that after I have handed over one part of geography to the geologist, another to the meteorologist, and others to the botanist and zoologist, and have nevertheless found it necessary to make even the anthropogeographer trench on the ground of all of them, I am now making him trench on the domains of the historian and the economist. My reply is that I frankly admit it; but that in regard to the life of man, so important are the influences attached to local conditions and place-relations that it is of the highest consequence to have a class of investigators whose constant and single aim is to see that the known causes that affect the value for man of place are never overlooked, and to be always searching for unknown causes that have the same effect. And I think I may add, as a proof of the weight due to that consideration, that it is not among economists and historians that such studies are discouraged, but rather among them that geography, specifically anthropogeography, as a separate branch of study, finds some of its most ardent supporters."

Dr. Stein's Expedition in Central Asia—Erratum.—In the *Journal* for December, 1908, page 600, line 2 from bottom, for "1866" read "1865."

OBITUARY.

A. Grigorief.

Our Honorary Corresponding Member, A. Grigorief, whose death we regret to record, was educated at the university of St. Petersburg, and at the beginning of his scientific career was a botanist; but his trips through the northern parts of European Russia, in the White sea, and on the shores of the Murman coast, developed in him the true geographical enthusiast, which he was in the best sense of the word.

The fact that the first circumnavigation of Asia by Nordenskiöld was stopped by ice at Kolyuchin bay, offered M. Grigorief the opportunity for a voyage round the southern part of that continent. When no news from the *Vega* arrived in Europe, the Imperial Russian Geographical Society despatched a rescue expedition, with the aid of M. Sibiriakof and on his ship, the interests of the society and all the scientific work of the expedition being put into the hands of the young naturalist, A. Grigorief. Unfortunately his voyage was unsuccessful: the ship was stranded on the shores of northern Japan, and before its final rescue the *Vega* itself arrived from Bering sea. M. Grigorief, unable to reach the northern

waters, took this opportunity of making some investigations in Japan, where he stayed about six months, and whence he brought home some collections for the society.

After a period of work in connection with the society, he was selected to occupy the post of its general secretary, a very responsible and arduous position, which he occupied during twenty years, with great honour to himself and great profit to the society. During this period a great many large and important expeditions were equipped by the society for investigation in Central Asia, which was in a great part revealed to the world by the work of Russians. The first international Polar expedition also took place during this time, and the two Russian stations at Novaya Zemlya and the mouth of the Lena were organized by the society. All the work of preparation for these expeditions, to which their greater or less success is often due, was made under his supervision.

During the twenty years of his secretaryship, M. Grigorief was continually at his post, and all who wished to do something for the advancement of geographical science in Russia, were sure to get assistance and a warm welcome from the secretary of the society. Many young voyagers and geographers owe their first success to his good advice. He was not a great traveller, not a great theorist, but his wide scientific education and his encyclopædic knowledge, especially about Asia, gave him great authority, which was placed freely at the disposal of his colleagues and much facilitated their work in the advancement of geographical science. In this sense he may be said to have taken part in all the important geographical work done by the members of the society during the last quarter of the nineteenth century. His genial character made him easy of approach for all who had need of his help, and his death is alike a serious loss to all true devotees of science and a great grief to the large circle of his friends.

J. DE SCHOKALSKY.

CORRESPONDENCE.

The Trans-Himalayan Range.

IN several magazine articles published during the autumn Dr. Sven Hedin lays claim to the *discovery* of a *new* mountain range or system to the north of the Brahmaputra. He names it the Trans-Himalaya. This is repeated in a modified form in his communication in the November number of the *Geographical Journal*.* In reference to the Trans-Himalaya he writes, "one-third of the range, or rather system . . . is absolutely new."

Reference to Table XXVII. in Colonel Burrard and Mr. Hayden's 'Sketch of the Geography and Geology of the Himalaya Mountains and Tibet' (Calcutta, 1907) will reveal a group of ten peaks, ranging from 20,000 to over 23,000 feet in height, lying between 84° and 87° E. These peaks were triangulated in 1904 by Captain Wood in the course of Captain Rawling's Gartok expedition. They are included by Colonel Burrard in his "Kailas Range." This is obviously the Trans-Himalayan system under discussion, and Colonel Burrard says of it (p. 95) "trigonometrical observations show that it joins with a range of Tibet, known as the Ninchinthangla, in longitude 88°," a point which Dr. Sven Hedin himself fully confirms. Colonel Burrard's Frontispiece Chart leaves no room for doubt on this point either. The "absolutely new" section of this range cannot, therefore, be taken as more than the distance between W. 135 (N. 29° 55′ 16″, E. 84° 33′ 33″) and the

* Vol. 32, p. 527.

easterly extremity of the Kailas group in the vicinity of Mariam La, a distance of about 100 miles.

But the existence and general continuity of this great mountain system has been fully recognized for more than half a century, leaving aside all question of mediæval Italian information. Thus Brian Hodgson * shows it on his map as the "Nyenchhen Thangla Chain," with the added legend "separating southern from northern Tibet." The extent and nomenclature of this range was again discussed in the *Geographical Magazine* † for 1877 by Sir Clements Markham and Mr. Trelawney Saunders, and it is shown on the latter's well-known map as the "Gangri Mountains." The delineation of the range in the map issued (1882) with vol. 1 of Atkinson's 'Himalayan Districts,' is practically identical with that shown in Dr. Sven Hedin's sketch-maps which have appeared in various magazines and newspapers.

During the discussion on Mr. St. George Littledale's paper ‡ in 1896, Sir Clements Markham, recognizing the general continuity of the range, dwelt on the fact that it had not been crossed between the Khalamba pass and the neighbourhood of the Mariam La. It is this great feat which Dr. Sven Hedin has now accomplished, crossing the range not once only, but on some ten different occasions; but it seems hardly consistent, under the circumstances, to speak of the *discovery* of a new range.

I must not omit to record that some of these points have been already raised in Germany by Herr H. Habenicht of Justus Perthes' Geographische Anstalt.

Discussion of the question as to the discovery of the sources of the Brahmaputra, Satlej, and Indus would unduly lengthen this letter.

T. G. Longstaff.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1908–1909.

Third Meeting, November 30, 1908.—Major Leonard Darwin, President, in the Chair.

Elections:—*Percy Herbert Ashmead; Edward J. M. Chaplin, M.A.; William Henry Foxall; Walter Edney Madkins, B.A.; J. S. H. Matson; Joseph Wilson.*

The paper read was:—

"The Panama Canal in 1908." By Dr. Vaughan Cornish.

Fourth Meeting, December 7, 1908.—Major Leonard Darwin, President, in the Chair.

The paper read was:—

"The Danish North-East Greenland Expedition." By Lieut. A. Trolle, R.D.N.

Fifth Meeting, December 14, 1908.—Major Leonard Darwin, President, in the Chair.

Elections:—*William Edmund Calver; Ronald Egerton Critchley-Salmonson (Royal Fusiliers); Dr. John Downie Falconer, M.A.; Laurence Harris; Follett*

* Brian Hodgson, 'Selections from the Records of the Government of Bengal,' p. 88, etc. Calcutta: 1857.

† Vol. 4, pp. 114 and 176 *et seq.*

‡ *Geographical Journal*, 1896, vol. 7, p. 482.

Holt; *Captain R. B. Hopkins*; *R. P. Lewis* (*Devonshire Regt.*); *Francis V. Lister*; *Prof. Patrick Marshall*; *Commander W. J. Matthews, R.N.*; *F. C. Molesworth, R.E.*; *Ernest Albert Parkyn*; *H. B. Popham* (*Gold Coast Regt.*); *J. A. Singleton*; *Warren Du Pré Smith*; *Engineer-Commander Reginald William Skelton*; *Thomas Enoch Williams*; *Geoffrey Winthrop Young*.

The paper read was:—

"Fifty Years of Nile Exploration." (Jubilee of Speke's Discovery of the Victoria Nyanza.) By Sir William Garstin, G.C.M.G.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are as a rule written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C.R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
k.k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half inch. The size of the *Journal* is $10 \times 6\frac{1}{2}$.

"A selection of the works in this list will be noticed elsewhere in the Journal."

EUROPE.

Alps—Valley-forms. *Z. Gletscherkunde* **2** (1908): 321-361. **Hess.**
Alte Talboden im Rhonegebiet. Von Hans Hess. *Map and Sections.*

Austria—Lower Austria. *M. Prähist. Kom., K.A.W. Wien* **2** (1908): 1-39. **Dungel.**
Die Flachgräber der Hallstattzeit bei Statzendorf in Niederösterreich. Von Adalbert Dungel. *Illustrations.*

Balkan Peninsula. **Cvijić.**
Petermanns M., Ergänzungsheft **162** (1908): pp. viii. and 392.
Grundlinien der Geographie und Geologie von Mazedonien und Altserbien; nebst Beobachtungen in Thrazien, Thessalien, Epirus und Nordalbanien. Von Dr. J. Cvijić. I. Teil. *Maps, Illustrations, and Sections.*

Central Europe—Jura. *Beiträge Geol. Karte Schweiz* **22** (1908): pp. 52. **Schaad.**
Die Juranagelfluh. Von Dr. Ernst Schaad. *Map, Illustrations, and Sections.*

Europe. **Mackinder.**
Lands beyond the Channel: an elementary study in geography. By H. J. Mackinder. London: G. Philip & Son, 1908. Size $7\frac{1}{2} \times 5$, pp. xii. and 276. *Maps and Illustrations. Price* 1*s.* 9*d. Presented by the Publishers.*

Europe—Agriculture. **Rutter.**

Cereal Production of Europe. By Frank R. Rutter. (U.S. Department of Agriculture.—Bureau of Statistics, Bulletin 68.) Washington, 1908. Size 9 × 6, pp. 100.

Europe—Trade. **Rutter.**

European Grain Trade. By Frank R. Rutter. (U.S. Department of Agriculture, Bulletin 69.) Washington, 1908. Size 9 × 6, pp. 64.

Färoe Islands. **Ransom.**

The Färoes. By Edwin Ransom. (Reprinted from the *Beds. Standard*, Friday, October 16, 1908.) Size 7½ × 5, pp. 8.

France—Alps. *C.R.A. Sci. Paris* **147** (1908): 568-569. **Helbronner.**

Sixième campagne géodésique dans les hautes régions des Alpes françaises. Par M. Paul Helbronner.

The stations occupied during the summer of 1908 completed the chain begun in 1907.

France—Anthropology. *M. Prähist. Kom., K.A.W. Wien* **2** (1908): 41-125. **Obermaier.**

Die Steingeräte des französischen Altpaläolithikums. Eine kritische Studie über ihre Stratigraphie und Evolution. Von Dr. Hugo Obermaier. *Illustrations.*

France—Cartography. *Ann. G.* **17** (1908): 289-301. **Girardin.**

Le procès de la Carte de France. A propos de la cartographie alpine. Par Paul Girardin.

France—Corsica. **Whitwell.**

Through Corsica with a paint-brush. By Mrs. E. R. Whitwell. Darlington: W. Dresser & Sons, 1908. Size 9 × 5½, pp. vi. and 68. *Sketch-map and Illustrations. Presented by the Author.*

France—Meteorology. *La G., B.S.G. Paris* **18** (1908): 29-43. **Girardin.**

Sur un cas rare de visibilité du Mont Blanc à longue distance. Par Paul Girardin.

See note in the December number (p. 625).

France—Meuse. **Vidal de la Blache.**

Etude sur la vallée lorraine de la Meuse. Par le capitaine J. Vidal de la Blache. Paris: A. Colin, 1908. Size 9 × 5½, pp. 190. *Maps, Sections, and Diagrams. Price 4 fr. Presented by the Publisher.*

France—Montpellier. **Fernand.**

B.S. Languedoc. G. **29** (1906): 349-363; **30** (1907): 14-27.

Considérations ethnographiques et géologiques sur les environs de Montpellier. Par C. Fernand.

France—Morvan. *La G., B.S.G. Paris* **18** (1908): 23-32. **Levainville.**

La toponymie morvandelle. Par Levainville. *Sketch-map.*

France—Normandy. **Revel.**

La Normandie et les Normands. Conférence faite à la Bibliothèque populaire de Versailles. (Salle des Conférences de l'Hôtel de Ville.) Le Jeudi 7 Mai 1908. Versailles, 1908. Size 7½ × 5, pp. 40. *Presented by the Author.*

France—Rivers. *La G., B.S.G. Paris* **18** (1908): 43-44. **Rabot.**

Le capture de la Sambre supérieure par l'Oise [d'aprés M. A. Briquet]. Par Charles Rabot. *Sketch-maps.*

Germany—Elbe. **Linde.**

Die Niederelbe. Von Prof. Dr. Richard Linde. Berlin, etc.: Velhagen & Klasing, 1908. Size 11 × 7½, pp. viii. and 252. *Map and Illustrations. Price* 8*m.*

A synthesis of the geography of the lower Elbe.

Germany—Frankfort.

Statistische Jahresübersichten der Stadt Frankfurt am Main . . . herausgegeben durch das Statistische Amt. Ausgabe für das Jahr 1906-07. (Erstes Ergänzungsheft zum Statistischen Handbuch der Stadt Frankfurt am Main.) Frankfurt-a-M., 1908. Size 11 × 7½, pp. vi. and 124.

Germany—Hydrology. **Gennerich.**

Die Flüsse Deutschlands. Von E. Gennerich. (Sonderabdruck aus der *Zeitschrift für Gewässerkunde*, Band viii., Hefte 3 u. 4.) Dresden: W. Baensch, 1908. Size 10 × 7, pp. 168. *Diagrams and Sections. Price* 8*m.*

A useful compendium of information, based on Keller's voluminous work.

Germany—Meteorology. **Süring.**

Veröffentlichungen des K. Preussischen Meteorologischen Instituts, Nr. 195. Ergebnisse der Gewitter-Beobachtungen in den Jahren 1903, 1904 und 1905. Von R. Süring. Berlin, 1908. Size 13 × 10, pp. xlviii. and 102. *Maps.*

Germany—Saxony. *M.V.E. Dresden* (1908): 83–129. **Drude.**

Pflanzengeographische Karten aus Sachsen. I. Weinböhla; II. Zschirnsteine; III. Altenberg. Von Prof. Dr. Oscar Drude. *Maps and Illustrations.*

The three maps deal with districts at different altitudes, and therefore in great measure supplement each other. The method of representing plant-associations in maps is discussed

Hungary. **Bovill.**

Hungary and the Hungarians. By W. B. Forster Bovill. London: Methuen & Co., [1908]. Size 9 × 5½, pp. xxii. and 352. *Sketch-map and Illustrations. Price 7s. 6d. net. Presented by the Publishers.*

Spain—Balearic Islands. **Markham.**

The story of Majorca and Minorca. By Sir Clements R. Markham. London: Smith, Elder, & Co., 1908. Size 8½ × 5½, pp. x. and 310. *Maps. Price 7s. 6d. net. Presented by the Publishers.*

ASIA.

Afghanistan. *B.G.S. Philadelphia* **6** (1908): 1–9. **Huntington.**

The Relation of Afghanistan to its Neighbours. By Dr. Ellsworth Huntington. *Illustrations.*

Afghanistan. *Tour du Monde* **14** (1908): 49–96, 313–360. **Lacoste.**

Autour de Afghanistan. Par le commandant de Bouillane de Lacoste. *Sketch-maps and Illustrations.*

Asia—Historical. **Temple.**

Indian Antiquary **35** (1906): 131–142, 168–178, 203–210; **36** (1907): 98–105, 125–134, 173–179; **37** (1908): 156–170.

The Travels of Richard Bell (and John Campbell) in the East Indies, Persia, and Palestine. 1654–1670. By Sir R. C. Temple.

Central Asia. **Zugmayer.**

Eine Reise durch Zentralasien im Jahre 1906. Von Dr. Erich Zugmayer. Berlin: D. Reimer, 1908. Size 10 × 7, pp. xii. and 442. *Map and Illustrations. Price 12m. Presented by the Publisher.*

Dr. Zugmayer's expedition was referred to in the *Journal*, vol. **29**, pp. 87, 223.

Central Asia—Alai. *Iz. Turkestan Br., Imp. Russian G.S.* **7** (1907): 1–21. **Berg.**

A journey to the glaciers of the upper Isfara (Turkestan range; basin of the Syr-Daria). By L. Berg. *Map and Illustrations.* [In Russian.]

Ceylon—Anthropology. **Sarasin.**

Ergebnisse naturwissenschaftlicher Forschungen auf Ceylon. Von Dr. Paul Sarasin und Dr. Fritz Sarasin. IV. Band: Die Steinzeit auf Ceylon. Weisbaden: C. W. Kreidel, 1908. Size 14½ × 11½, pp. vi. and 94. *Illustrations. Presented by the Authors.*

China—Fokien. *J. Linnean S., Botany* **38** (1908): 350–373. **Dunn.**

A Botanical Expedition to Central Fokien. By S. T. Dunn.

China—Trade. ——

China: Imperial Maritime Customs. Returns of Trade and Trade Reports, 1907. Three Parts. Shanghai, 1908. Size 11 × 8½, pp. (Part 1, A and B) 28 and 50; (Part 2, in 5 "volumes") 668; (Part 3, in 2 "volumes") 416. *Maps and Diagrams.*

Chinese Empire—Tibet. *J. East Indian Association* **41** (1908): 1–18. **Black.**

The trade and resources of Tibet. By C. E. D. Black.

Cyprus. **Richards.**

The Cyprus Civil List, 1908. Third edition. Compiled by T. H. Hatton Richards. Nicosia, 1908. Size 10 × 6½, pp. 200. *Map. Presented by the Chief Secretary to Government, Cyprus.*

Cyprus—Famagusta. *J.R.I. Brit. Architects* **15** (1908): 625–648. **Jeffery.**

Famagusta. By George Jeffery. *Plans, Sections, and Illustrations.*

Eastern Asia. **Angier.**

The Far East revisited: essays on political, commercial, social, and general conditions in Malaya, China, Korea, and Japan. By A. Gordon Angier. With a preface by Sir Robert Hart. London: Witherby & Co., 1908. Size 9 × 6, pp. xii. and 364. *Sketch-maps and Illustrations. Price* 10*s.* 6*d. net. Presented by the Publishers.*

An instructive account of conditions in the Far East as they appeared to the editor of the *London and China Express.*

India.

Annual Report of the Board of Scientific Advice for India for the year 1906–07. Calcutta, 1908. Size 10½ × 7, pp. 140 and x. *Sketch-maps and Diagrams.*

See Monthly Record, *ante*, p. 88.

India—Eastern Bengal and Assam. **Hart.**

Report on the trade between the province of Eastern Bengal and Assam and the adjoining foreign tribes and countries for the three years ending March 31, 1908. By S. G. Hart. Shillong, 1908. Size 13 × 8½, pp. 22. *Price* 1*s.* 6*d.*

India—Marine Survey.

Administration Report of the Marine Survey of India for the official year 1907–1908. Bombay, 1908. Government Central Press. Size 13½ × 8, pp. 10. *Presented by the Surveyor in charge.*

Two new surveying vessels, with all the newest appliances, were commissioned during the year.

India—North-Western Frontier.

Gazetteer of the Hazara district, 1907. Compiled and edited by H. D. Watson . . . under the authority of the North-West Frontier Province Government. London: Chatto & Windus, 1908. Size 9 × 5½, pp. xvi. and 364. *Maps and Illustrations. Presented by the Secretary of State for India.*

Turkey. **Jebb.**

By desert ways to Baghdad. By Louisa Jebb (Mrs. Roland Wilkins). London: T. Fisher Unwin, 1908. Size 9 × 5½, pp. 318. *Map and Illustrations. Price* 10*s.* 6*d. net. Presented by the Publishers.*

Account of an unconventional journey by two young English ladies, with little or no previous experience.

Turkey—Asia Minor. **Nettancourt-Vaubecourt.**

Jean de Nettancourt-Vaubecourt. Sur les grandes routes de l'Asie Mineure. Les parcours ferrés de la péninsule: lignes des chemins de fer "Ottoman d'Anatolie" et de "Bagdad"; lignes "d'Aïdin" et de "Cassaba." Paris: E. Leroux; London: Luzac & Co., 1908. Size 8½ × 11, pp. 56. *Map and Illustrations. Price* 12 *francs. Presented by the Publisher.*

A general description of Asia Minor and its railways, appealing chiefly to the tourist, to whom it should prove useful.

AFRICA.

Abyssinia. **Holtz.**

Im Auto zu Kaiser Menelik. Von Arnold Holtz. Berlin—Charlottenburg: Vita, [1908]. Size 10½ × 8, pp. iv. and 92. *Illustrations. Price* 3*m.* 50. *Presented by the Publisher.*

The writer, whose acquaintance with Abyssinia is of some years' standing, lately made the journey from the terminus of the French railway to the capital in a motor car, and here gives a popular account of the same. There is a portrait of the Emperor in his robes of state.

Africa—Phytogeography. **Engler.**

Die Vegetation der Erde. Sammlung pflanzengeographischen Monographien; herausgegeben von A. Engler und O. Drude. IX. Die Pflanzenwelt Afrikas inbesondere seiner tropischen Gebiete. Grundzüge der Pflanzenverbreitung in Afrika und die Charakterpflanzen Afrikas. Von A. Engler. II. Band. Leipzig: W. Engelmann, 1908. Size 10 × 7, pp. xii. and 460. *Illustrations. Price* 18*m.*

Vol. 1 does not appear to have yet been issued.

Belgian Congo. *Mouvement G.* **25** (1908): 481–486. **Wauters.**

Le Congo Belge. Une séance historique: le vote de l'annexion. Par A.-J. Wauters.

Account of the sitting of the Belgian Chamber on August 20 last.

Belgian Congo—Ethnology. *B.S.R. Belge G.* **32** (1908): 36-80, 93-133. **Demuenynck.**

Au pays de Mahagi, région du Lac Albert et du Haut-Nil (État indépendant du Congo). Mœurs et coutumes des Alulus. Par le Lieut. Demuenynck. *Map and Illustrations.*

Belgian Congo—Ethnology. *B.S.R. Belge G.* **32** (1908): 134-140. **Demuenynck.**

Les pygmées du Haut-Ituri. Par le Lieut. Demuenynck. *Illustrations.*

British East Africa—Kinangóp. **Perlo and others.**

B.S.G. Italiana **9** (1908): 653-672, 746-765.

Un ascensione sul Kinangòp (m. 4500) nell' Africa equatoriale. Introduzione del P. Filippo Perlo. *Illustrations.*

An account of an ascent by Italian padres of the Industrial Station in Kikuyu. Kinangop is spoken of as the highest peak of the Aberdare range, though its height was fixed by Captain G. E. Smith as some 350 feet lower than Sattima, and even this as only 13,390 feet in place of the 14,760 of the padres (see *ante*, p. 91).

British East Africa—Survey.

Survey Department, British East Africa. Annual report, Financial year 1907-08. [Type-written sheets.] Size 13 × 8, 15, 32, and 21 ll. *Maps, Diagrams, and Illustrations.*

Cape Colony—Geology.

Cape of Good Hope. Department of Agriculture. Twelfth Annual Report of the Geological Commission, 1907. Cape Town, 1908. Size 9½ × 7, pp. 192. *Plans and Sections.*

Egypt. **Barron.**

Finance Ministry. Survey Department, Egypt. The topography and geology of the district between Cairo and Suez. By T. Barron. Cairo: National Printing Department, 1907. Size 10½ × 7½, pp. 134. *Map, Illustrations, and Sections.*

Egypt—Desert. *Cairo Sci. J.* **21** (1908): 279-286, 314-325. **Hume.**

The South-Western Desert of Egypt. By Dr. W. F. Hume. *Map.*

Egypt—Hydrology. *Cairo Sci. J.* **2** (1908): 16-23. **Beckett.**

Notes on the underground water of Egypt. By H. W. Beckett.

Egypt—Meteorology. *Cairo Sci. J.* **2** (1908): 29-30. **Keeling.**

Upper Air research at Helwan Observatory. By B. F. E. Keeling.

Egypt—Nile. **Lucas.**

Ministry of Finance. Survey Department, Egypt. The chemistry of the River Nile. By A. Lucas. Cairo, 1908. Size 10½ × 7, pp. 78. *Map and Diagram.*

Egypt—Surveys. **Lyons.**

Ministry of Finance, Survey Department, Egypt. A report on the work of the survey department in 1907. By Captain H. G. Lyons. Cairo, 1908. Size 10½ × 7½, pp. 80. *Maps and Diagrams.*

Egyptian Sudan—Language. **Owen.**

Bari grammar and vocabulary. Edited by Captain R. C. Owen. London: J. & E. Bumpus, 1908. Size 8 × 5½, pp. viii. and 164. *Presented by the Author.*

A praiseworthy contribution towards a knowledge of a little-known language, though the explanations are not always quite as lucid as could be wished.

Morocco. **Jeannot.**

Étude sociale, politique, et économique sur le Maroc. Par Gustave Jeannot. Dijon: Jacquot et Floret, 1907. Size 10 × 6½, pp. 468. *Sketch-map. Price* 6*s.* 6*d.*

A useful study of existing conditions in Morocco, introduced by an outline of its physical geography.

Morocco. **Rankin.**

In Morocco with General d'Amade. By Reginald Rankin. London: Longmans, Green, & Co., 1908. Size 9 × 6, pp. xiv. and 304. *Map and Illustrations. Price* 9*s. net. Presented by the Publishers.*

NORTH AMERICA.

Alaska. *U.S. Geol. Surv. B.* **337** (1908): pp. 102. **Prindle, Hess, and Covert.**

The Fairbanks and Rampart Quadrangles, Yukon-Tanana Region, Alaska. By L. M. Prindle; with a section on the rampart placers by F. L. Hess; and a paper on the water-supply of the Fairbanks Region by C. C. Covert. *Maps and Diagram.*

The map is the second of the series, of which the individual items are to cover quadrangular areas bounded by meridians and parallels (cf. *Journal*, vol. **30**, p. 563).

Alaska—Bogoslof Volcano. *B. American G.S.* **40** (1908): 385–400. **Jaggar.**

The Evolution of Bogoslof Volcano. By T. A. Jaggar, jun. *Sketch-maps and Illustrations.*

See note in the Monthly Record, December, p. 621.

Alaska—Boundary. **Tittmann.**

Progress of the Demarcation of the Alaska Boundary. By O. H. Tittmann. (Reprinted from *Proceedings of the American Philosophical Society*, vol. **47**, 1908.) Size 9½ × 6½, pp. 86–90.

See note in November number, p. 532.

Alaska—Ethnology. **Swanton.**

The Jesup North Pacific Expedition. Vol. **10**, part 2: Haida texts – Masset dialect. By John R. Swanton. Leyden and New York, 1908. Size 14 × 11, pp. 271–812 and viii. *Price* 22*s.* 6*d.*

Alaska—Gold. *U.S. Geol. Surv. B.* **328** (1908): pp. 344. **Collier and others.**

The Gold placers of parts of Seward Peninsula, Alaska. Including the Nome, Council, Kougarok, Port Clarence, and Goodhope precincts. By Arthur J. Collier, Frank L. Hess, Philip S. Smith, and Alfred H. Brooks. *Maps, Sketch-maps, Diagrams, and Illustrations.*

Alaska—Minerals. *U.S. Geol. Surv. B.* **345** (1908): pp. 294. **Brooks and others.**

Mineral Resources of Alaska. Report on progress of investigations in 1907. By Alfred H. Brooks and others. *Maps and Illustrations.*

Alaska—Mount McKinley. **Cook.**

To the top of the continent: discovery, exploration, and adventure in Sub-Arctic Alaska. The first ascent of Mount McKinley, 1903–1906. By Dr. Frederick A. Cook. London: Hodder & Stoughton, 1908. Size 9½ × 6½, pp. xxii. and 322. *Sketch-maps and Illustrations. Price* 12*s. net.* [See Review in vol. **32**, p. 614.]

Alaska and Bering Sea. **Maclear.**

Alaska and Bering Sea Pilot, including the North-East coast of Siberia. Originally compiled from various sources by Vice-Admiral J. P. Maclear. 2nd edit. London: J. D. Potter, 1908. Size 9½ × 6, pp. xxvi. and 620. *Charts. Price* 7*s.* 6*d. Presented by the Hydrographer to the Admiralty.*

Canada. **Loir.**

Dr. Adrien Loir. Canada et Canadiens. Paris: E. Guilmoto, 1909 [1908]. Size 8½ × 5½, pp. 372. *Price* 6 *fr. Presented by the Publisher.*

Mexico. **Gadow.**

Through Southern Mexico; being an account of the travels of a naturalist. By Dr. Hans Gadow. London: Witherby & Co., 1908. Size 9 × 6, pp. xvi. and 528. *Sketch-maps and Illustrations. Price* 18*s. net. Presented by the Publishers.*

Deserves to take a high place among the travel-narratives of naturalists.

CENTRAL AND SOUTH AMERICA.

Bolivia—Railways. ———

Informe del Inspector Fiscal de los Ferrocarriles de "The Bolivian Railway Company," 1908. La Paz: Hugo Heitmann, 1908. Size 9½ × 6½, pp. 50.

Bolivia and Paraguay. **Saavedra.**

La cuestión fronteriza con el Paraguay. Por B. Saavedra. La Paz: Talleres Graficos "La Prensa," [1908]. Size 8½ × 5½, pp. 24.

Brazil. *B. Museu Goeldi* **5** (1908): 200–208. **Goeldi.**

Aspectos da natureza do Brazil. Pelo Prof. Dr. Emilio A. Goeldi.

Brazil. ———

Brazil. Report for the year 1907 and previous years on the trade of the consular district of Pará. Diplomatic and Consular Reports, Annual Series, No. **4111**, 1908. Size 9½ × 6, pp. 62. *Sketch-map. Price* 7½*d.*

Includes some notes on the character of the bed of the Amazon and the influence of the sea upon its navigability.

Brazil—Ethnology. **Koch-Grünborg.**

Zwei Jahre unter den Indianern: Reisen in Nordwest-Brasilien 1903-1905. Von Dr. Theodor Koch-Grünberg. Lieferung I. Berlin: E. Wasmuth, 1908. Size 11½ × 8, pp. iv. and 1-24. *Maps and Illustrations. Price* 75 *Pfg.*

This important work is to be completed in 24 parts.

Brazil—São Paulo. **Mattos.**

Secretaria da Agricultura, Commercio e Obras Publicas do Estado de S. Paulo: Secção Meteorologica, Serie 2*a*, No. 3. O Serviço Meteorologico e o Clima do Estado de S. Paulo. Por J. N. Belfort Mattos. S. Paulo, 1908. Size 9 × 6½, pp. 18. *Maps and Illustration.*

Central and South America. **Ruhl.**

The other Americans: the cities, countries, and especially the people of South America. By Arthur Ruhl. London: S. Werner Laurie, [1908]. Size 8⅛ × 5½, pp. xii. and 322. *Sketch-map and Illustrations. Price* 8*s.* 6*d. net. Presented by the Publisher.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australia—Meteorology. *Monthly Weather Rev.* **36** (1908): 215-219. **Mares.**

Australian Weather. By David J. Mares. *Sketch-maps.*

Australia—Murray Basin. **Privat-Deschanel.**

Ann. G. **17** (1908): 145-160, 224-237, 302-318.

La question de l'eau dans le bassin du Murray. Par Paul Privat-Deschanel. *Maps, Illustrations, and Sections.*

A careful piece of work, evidently based on a study of all the available data.

Marshall Islands—Native Chart. *Man* **8** (1908): 146-148. **Joyce.**

Note on a Native Chart from the Marshall Islands in the British Museum. By T. A. Joyce. *Charts and Key-plan.*

See an account of the stick-maps of the Marshall islands in vol. **21**, p. 177.

Melanesia. *Nature* **78** (1908): 393-394. **Haddon.**

The Percy Sladen Trust Expedition to Melanesia. By Dr. A. C. Haddon.

This expedition went out towards the end of 1907 under Dr. W. H. R. Rivers of Cambridge, for sociological research, the first results of which are here noted.

New Guinea. *Deutsch Kolonialblatt* **19** (1908): 948-949. ——

Die Waria-Expedition. *Map.*

This river, which enters the sea close to the Anglo-German frontier (cf. account of Mr. Monckton's expedition in the November number), was visited by the governor of German New Guinea, accompanied by a surveyor, from whose notes this short account is taken.

New Guinea—British. ——

Parliament of the Commonwealth of Australia, 1907-8, Papua: Annual report for the year ending June 30, 1907. Melbourne, 1908. Size 13 × 8, pp. 142. *Map and Illustrations.*

Reference was made to the chief geographical items in this report in the September number (vol. **32**, p. 270).

New Guinea—Dutch. *National G. Mag.* **19** (1908): 527-545. **Barbour.**

Further notes on Dutch New Guinea. By Thomas Barbour. *Illustrations.*

New Guinea—Dutch. *Ts. K. Nederland. Aard. Genoots.* **25** (1908): 1179-1189. **Hellwig.**

Verrichtingen van het Militaire Exploratie-Detachement op Zuid Nieuw-Guinea gedurende April 1906. Door R. L. H. Hellwig. *Map and Panoramas.*

New South Wales—Mineral Resources. **Carne.**

New South Wales. Department of Mines and Agriculture. Geological Survey. Geology, No. 6. Geology and Mineral resources of the Western coalfield. By J. E. Carne. Sydney, 1908. Size 12 × 9½, pp. xii. and 264. *Illustrations and Sections, Maps in separate case. Price* 15*s.*

New South Wales—Winds and Fish. **Dannevig.**

J. and P.R.S. New South Wales **41** (1907): 27-45.

On some peculiarities in our coastal winds and their influence upon the abundance of fish in inshore waters. By H. C. Dannevig. *Diagrams.*

New Zealand—Geology. **Fraser and Adams.**

New Zealand Geol. Survey, B. No. 4 (1907): pp. x. and 154.

The geology of the Coromandel subdivision, Hauraki, Auckland. By Colin Fraser, assisted by James Henry Adams. *Maps, Sections, and Illustrations.*

New Zealand—Geology. **Park.**

New Zealand Geol. Survey, B. No. 5 (1908): pp. viii. and 92.

The geology of the Cromwell subdivision, Western Otago division. By James Park. *Maps, Sections, and Illustrations.*

New Zealand—Historical. **Horsley.**

The Romance of Empire: New Zealand. By Reginald Horsley. London: T. C. & E. C. Jack, 1908. Size 8½ × 6, pp. xiv. and 332. *Sketch-map and Illustrations. Price 6s. net. Presented by the Publishers.*

South Australia—Ethnology. **Eylmann.**

Die Eingeborenen der Kolonie Südaustralien. Von Dr. Erhard Eylmann. Berlin: D. Reimer, 1908. Size 11½ × 7½, pp. 28 and 494. *Map and Illustrations. Price 40m. Presented by the Publisher.*

POLAR REGIONS.

Antarctic—Scottish Expedition. **Melvill and Standen.**

T.R.S. Edinburgh **46** (1907-8): 119-158.

The marine mollusca of the Scottish National Antarctic Expedition. By James Cosmo Melvill and Robert Standen. *Illustrations.*

Arctic. **Harrison.**

In search of a Polar Continent, 1905-1907. By Alfred H. Harrison. London: E. Arnold, 1908. Size 9 × 5½, pp. xx. and 292. *Map and Illustrations. Price 12s. 6d. net. Presented by the Publisher.* [See review, December number, p. 615.]

Arctic—Peary Expeditions. *National G. Mag.* **19** (1908): 661-668. **Bridgman.**

Ten years of the Peary Arctic Club. By Herbert L. Bridgman. *Illustrations.*

Greenland **Nordenskjöld.**

On the Geology and Physical Geography of East Greenland. By Otto Nordenskjöld. (Reprinted from *Meddelelser om Grønland*, vol. **28.**) Copenhagen: Bianco Luno, 1908. Size 9 × 6, pp. 153-284. *Map and Illustrations. Presented by the Author.*

Greenland—Eskimo. **Rasmussen.**

The people of the Polar North: a record. By Knud Rasmussen. Compiled from the Danish originals and edited by G. Herring. London: K. Paul & Co., 1908. Size 10 × 7, pp. xx. and 358. *Map and Illustrations. Price 21s. net. Presented by the Publishers.*

MATHEMATICAL GEOGRAPHY.

Geodesy—Base-measurement. **Benoit and Guillaume.**

Bureau International des Poids et Mesures. La mesure rapide des bases géodésiques. Par J.-René Benoit et Ch.-Ed. Guillaume. 4e édition. Paris: Gauthier-Villars, 1908. Size 9 × 4½, pp. 228. *Illustr. and Diagr. Price 3s. 9d.*

M. Benoit is a recognized authority on the subject.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Climatology. **Hann.**

Handbuch der Klimatologie. Von Dr. Julius Hann. Dritte . . . Auflage; I. Band—Allgemeine Klimalehre. (Bibliothek Geographischer Handbücher, begründet von Friedrich Ratzel. Neue Folge, herausgegeben von Prof. Dr. Albrecht Penck.) Stuttgart: J Engelhorn, 1908. Size 9 × 6, pp. xiv. and 394. *Sketch-maps and Diagrams. Price 13m. Presented by the Publisher.*

Geomorphology. **Suess.**

The face of the Earth (das Antlitz der Erde). By Edward Suess. Translated by Hertha B. C. Sollas, under the direction of W. J. Sollas. Vol. 3. Oxford: Clarendon Press, 1908. Size 10 × 6½, pp. viii. and 400. *Maps and Illustrations. Price 18s. net. Presented by the Publishers.*

Oceanic Life. **Johnstone.**

Conditions of life in the sea: a short account of quantitative marine biological research. By James Johnstone. Cambridge: University Press, 1908. Size 8¼ × 5½, pp. xiv. and 332. *Charts and Illustrations. Price 9s. net. Presented by the Publishers.*

Oceanography. **Herwig.**

Die beteiligung Deutschlands an der Internationalen Meeresforschung. IV.—V. Jahresbericht, erstattet von dem Vorsitzenden der Wissenschaftlichen Kommission Dr. W. Herwig. Berlin: O. Salle, 1908. Size 11½ × 8, pp. viii. and 288. *Maps, Illustrations, and Sections. Presented by the Commission.*

Phytogeography. **Wiesner.**

Der Lichtgenuss der Pflanzen: photometrische und physiologische Untersuchungen mit besonderer Rücksichtnahme auf Lebensweise, geographische Verbreitung und Kultur der Pflanzen. Von Prof. J. Wiesner. Leipzig: W. Engelmann, 1907. Size 9½ × 6½, pp. viii. and 322. *Illustrations and Diagrams. Price 8s. 1d.*

Prof. Wiesner's researches on the relation between plant-life and light have been frequently alluded to in the *Journal* (vols. **10**, p. 331; **17**, p. 665; **26**, p. 459).

Seismology. **Knott.**

The physics of earthquake phenomena. By Cargill Gilston Knott. Oxford: Clarendon Press, 1908. Size 9 × 5½, pp. xii. and 284. *Sketch-maps, Diagrams, and Illustrations. Price 14s. net. Presented by the Publishers.*

A valuable discussion of earthquake phenomena, but from a physicist's, rather than a geographer's, point of view.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography. **Vallaux.**

Géographie sociale: la Mer. Populations maritimes, migrations, pêches, commerce, domination de la Mer. Par Camille Vallaux. Paris: O. Doin, 1908. Size 7½ × 5, pp. 378. *Price 5 fr. Presented by the Publisher.*

Anthropology. *Nineteenth Century* **64** (1908): 133–146. **Johnston.**

The Empire and anthropology. By Sir H. H. Johnston. Size 10 × 6½. *Also separate copy.*

Points out the wholly inadequate attention still given to anthropology in this country.

Commercial Geography. **Chisholm.**

Handbook of commercial geography. By Geo. G. Chisholm. 7th edit. London: Longmans, Green, & Co., 1908. Size 9 × 5½, pp. l. and 660. *Maps and Diagrams. Price 15s. net. Presented by the Publishers.*

This edition has been revised throughout and extended, the chief addition being that of a chapter on trade routes, illustrated by maps.

GENERAL.

British Empire—Historical. **Marshall.**

Our Empire story: stories of India and the greater Colonies, told to children by H. E. Marshall. London: T. C. & E. C. Jack, [1908]. Size 9½ × 6½, pp. xiv. and 494. *Sketch-maps and Illustrations. Price 7s. 6d. net. Presented by the Publishers.*

Geography. **Reich.**

Handbook of geography: descriptive and mathematical. By Emil Reich. 2 vols. London: Duckworth & Co., 1908. Size 8 × 6½, pp. (vol. 1) xxii. and 568; (vol. 2) xxiv. and 172. *Maps and Diagrams. Price* (vol. 1) *7s. 6d. net;* (vol. 2) *5s. net. Presented by the Publishers.*

OLDER WORKS ADDED TO THE LIBRARY AND MAP COLLECTION IN 1908.

Arnold, Christoph, and others.—Wahrhaftige Beschreibungen dreyer mächtigen Königreiche, Japan, Siam, und Corea. . . . Denen noch beygefüget Johann Jacob Merkleins . . . Ost-Indianische Reise. . . . *Map and Illustrations.* Size 6½ × 4. *Nuremberg*, 1672.

[A collection of pieces (some translated), including the well-known but scarce works of Caron and Schouten.]

[**Avril, Ph.**]—Voyage en divers états d'Europe et d'Asie, entrepris pour découvrir un nouveau chemin à la Chine . . . *Map and Illustrations.* Size 10 × 7. *Paris*, 1692.

Blaeu, Joan.—Novum ac magnum Theatrum Urbium Belgicæ Regiæ, ad præsentis temporis faciem expressum a Joanne Blaeu. 2 vols. *Presented by H. Yates Thompson, Esq.* *Amsterdam*, 1649.

Camden, William.—Britannia; sive florentissimorum regnorum Angliæ, Scotiæ, Hiberniæ, et insularum adiacentium. . . . Descriptio. *Maps and Illustrations.* Size 13 × 9. *Presented by H. Yates Thompson, Esq.* *London*, 1607.

Cecchi, Antonio.—Da Zeila alle frontiere del Caffa. Vol. 3. *Map and Profiles.* Size 9½ × 6. *Presented by the Società Geografica Italiana.* *Rome*, 1887.

[**Cockburn and others.**]—A journey over land from the Gulf of Honduras to the Great South Sea, performed by John Cockburn and five other Englishmen. . . . To which is added, a brief Discoverye of some Things best worth Noteinge in the Travels of Nicolas Withington. *Map.* Size 8 × 5. *London*, 1735.

Cortes, Martin.—The Arte of Navigation. Contayning a briefe description of the Spheare, with the parts and Circles of the same: as also the making use of certaine Instruments. . . . First written in Spanish by Martin Curtis, and translated into English by Richard Eden. *Map and Diagrams.* Size 7 × 5½. *Presented by Sir Henry Bulwer.* *London*, 1596.

Cubero, Pedro.—Peregrinacion del mundo. Size 8 × 5½. *Naples*, 1682.

Drude, Dr. Oscar.—Deutschlands Pflanzengeographie. Erster Teil. *Stuttgart*, 1896.

Dunn, John.—History of the Oregon Territory and British North-American Fur Trade. . . . Second edition. *Map.* Size 9 × 5½. *London*, 1846.

Ellis, W.—An authentic narrative of a voyage performed by Captain Cook and Captain Clarke, in His Majesty's Ships *Resolution* and *Discovery*, during the years 1776–1780. . . . 2 vols. *Map and Illustrations.* Size 8½ × 5½. *London*, 1783.

Estrella, Juan Christoval Calvete de.—El felicissimo viaje d'el muy alto y muy poderoso Principe Don Phelippe, Hijo del Emperador Don Carlos Quinto Maximo, desde España a sus tierras dela baxa Alemaña. . . . Size 11 × 7½. *Antwerp*, 1552.

Gilpin, William.—Remarks on forest scenery and other woodland views. . . . 2 vols. *Map and Illustrations.* Size 9 × 5½. *London*, 1808.

Henry, Alexander.—Travels and adventures in Canada and the Indian Territories between the years 1760 and 1776. Size 8½ × 5. *New York*, 1809.

Hessen, Elias.—Ost Indische Reise-Beschreibung, oder Diarium, was bey der Reise des . . . D. Benjamin, im Jahr 1680, von Dresden aus biss in Asiam auff die Insul Sumatra denckwürdiges vorgegangen. *Plan.* Size 6½ × 4. *Leipzig*, 1690.

[Bound in 1 vol. with Arnold's 'Beschreibungen von Japan, u.s.w.', *supra*.

Irving, Washington.—Astoria; or Enterprise beyond the Rocky Mountains. *Portrait.* Size 7 × 4½. *London*, 1839.

Masson, L. R.—Les Bourgeois de la Compagnie du Nord-Ouest: Récits de voyages, lettres, et rapports inédits relatifs au Nord-Ouest canadien. 2 vols. Size 9 × 6½. *Quebec*, 1889–90.

[**Miege, G.**]—A relation of three Embassies from His Sacred Majestie Charles III. to the Great Duke of Muscovie, the King of Sweden, and the King of Denmark. . . . *Portraits.* Size 7 × 4. *London*, 1669.

[**Oldmixon, John.**]—The British Empire in America. . . . Second edition. 2 vols. *Map.* Size 8 × 5. *London*, 1741.

Rivara, Joaquim Heliodoro da Cunha.—Catalogo dos manuscriptos da Bibliotheca Publica Eborense. Tomo I. Size 11 × 7½. *Presented by Sir C. R. Markham.* *Lisbon*, 1850.

Ross, Alexander.—The Fur Hunters of the Far West. A narrative of adventures in the Oregon and Rocky Mountains. 2 vols. *Map and Portrait.* Size 8 × 5. *London*, 1855.

Roy, Major-General William.—An account of the measurement of a base on Hounslow Heath. *Map and Illustrations.* Size 9½ × 7. *London*, 1785.

Roy, Major-General William.—An account of the mode proposed to be followed in the trigonometrical operation for determining the relative situation of the Royal Observatories of Paris and Greenwich. . . . *Maps and Diagrams.* Size 11 × 8½. *London*, 1787.

Sack, Baron Albert von.—A narrative of a voyage to Surinam; of a residence there during 1805, 1806, and 1807; and of the author's return to Europe by the way of North America. *Map and Illustrations.* Size 11 × 8½. *London*, 1810.

Sanson, [N.].—Voyage, ou relation de l'état present du royaume de Perse. *Illustrations.* Size 6½ × 4. *Paris*, 1695.

Schoolcraft, Henry R.—Narrative journal of travels from Detroit north-west through the great chain of American lakes to the sources of the Mississippi river. *Map and Illustrations.* Size 9 × 5½. *Albany*, 1821.

———.—Narrative of an expedition through the Upper Mississippi to Itasca lake . . . in 1832. *Maps.* Size 9 × 6. *New York*, 1834.

Van der Heiden, Frans Jansz.—Vervarelyke Schip-Breuk van't Oost-Indisch Jacht ter Schelling onder het Landt van Bengale . . . beneffens een bondige Beschrijving der Koningrijken van Arakan, Bengale, Martavan, Tanassery, etc. *Illustrations.* Size 8½ × 6½. *Amsterdam*, 1685.

Vigne, G. T.—Travels in Mexico, South America, etc., etc. 2 vols. *Map and Illustrations.* Size 7½ × 4½. *London*, 1863.

West, John.—The history of Tasmania. 2 vols. Size 9 × 5½. *Launceston*, 1852.

Xavier, Felippe Nery.—Bosquejo historico das communidades das Aldêas dos Concelhos das Ilhas, Salcete e Bardez. Size 11 × 7½. *Presented by Sir C. R. Markham.* *New Goa*, 1852.

[Bound in one volume with Rivara's 'Catalogo,' *supra.*]

Canada and New Brunswick Boundary.—Papers relative to the settlement of the disputed boundaries between the provinces of Canada and New Brunswick. *Maps.* Size 13 × 8. *London*, 1851.

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

Austria-Hungary. **Freytag and Berndt.**

Dislokationskarte des k. u. k. österr.-ung. Heeres, der Landwehren und der Gendarmerie-Korps im Jahre, 1908. Scale 1 : 1,800,000 or 1 inch to 28·4 stat. miles. Vienna: G. Freytag & Berndt, 1908. *Price* 3 *kr.* *Presented by the Publishers.*

Balkan Peninsula. **Kiepert.**

H. Kiepert's Generalkarte der Südost-Europäischen Halbinsel. Scale 1 : 1,500,000 or 1 inch to 23·7 stat. miles. Berlin: D. Reimer (Ernst Vohsen), 1908.

In view of recent events and possible further developments in the Balkan Peninsula, this revised edition of Kiepert's map is likely to prove useful. It shows the whole of the Balkan States, and includes Greece and the western part of Asia Minor.

British Isles. **Topographical Section, General Staff.**

Map of Great Britain showing Commands, Territorial Force Divisions and Districts. Scale 1 : 1,774,080 or 1 inch to 28 stat. miles. London: Topographical Section, General Staff, War Office, 1908. *Price* 6*d. net.* *Presented by the Director of Military Operations.*

British Isles—England and Wales. **Ordnance Survey**

Sheets published by the Director-General of the Ordnance Survey, Southampton, from November 1 to 30, 1908.

1-inch (third edition):—

In outline, 200. 1*s.* (engraved).

With hills in brown or black, 125, 126, 127, 128, 169, 173, 184, 311. 1*s. each* (engraved).

Large-sheet Series, printed in colours, folded in covers or flat in sheets, 109. *Price, on paper,* 1*s.* 6*d.*; *mounted on linen,* 2*s.*; *mounted in sections,* 2*s.* 6*d.*

6-inch—County Maps :—

Cornwall (First Revision), (61 N.E. and S.E.), 62 N.E., 67 S.E., 68 S.W., 69 N.W., S.E., 73 S.W., 77 N.W., 78 N.W., 83 S.W., 86 N.E., (86 S.E. and S.W.), 87*a* N.W. (88 N.E. and S.E.). **Kent** (Second Revision), 76 N.W. **Pembrokeshire** (First Revision), 14 S.W., 20 S.W., 32 N.E., 44 N.E. **Yorkshire** (First Revision of 1891 Survey), 217 S.W., 218 S.E., 219 S.W., 220 N.E., 231 N.E., N.W, 232 S.E., 233 N.E., 254 N.W., 267 N.W. 1*s. each.*

25-inch—County Maps :—

Hampshire (Second Revision), LXXIII. 14, 16; LXXIV. 13, 14; LXXVI. 8, 12, 16; LXXVIII. 6, 7, 9, 10, 11; LXXXI. 3, 4, 9; LXXXIV. 4, 8, 12; LXXXVIII. 5, 6, 7, 9, 13; XCIII. 2. **Kent** (Second Revision), X. 15; XVII. 7, 8, 11; XVIII. 5, 9, 13; XXX. 1, 13; XL. 7, 8, 15; XLI. 13; XLII. 9, 13; XLIX. 5, 6, 9, 11, 12; L. 3, 4, 5, 6, 9; LI. 9, 14, 15; LII. 13; LXI. 6, 7, 8, 12, 16; LXII. 1, 5, 9; LXX. 5. **Lancashire** (First Revision of 1891 Survey), LXXXVI. 2, 3, 4, 5, 7; XCIII. 9; XCIX. 14; CVI. 1, 5, 9. 3*s. each.* CVI. 13. 1*s.* 6*d.* **Yorkshire** (First Revision of 1891 Survey), CLXIV. 2, 4, 6, 7, 8, 11, 12, 15, 16; CLXV. 5; CLXXXI. 3, 4; CLXXXII. 1, 2, 4; CLXXXV. 12, 14, 15, 16; CLXXXVI. 14; CLXXXVII. 5, 13, 14, 15, 16; CLXXXVIII. 5, 6, 7, 9, 10, 11, 14, 15; CC. 4, 6, 7, 8, 12; CCI. 2, 3, 4, 11, 16; CCII. 2. 3*s. each.*

(*E. Stanford, London Agent.*)

British Isles—England and Wales. **Railway Clearing House.**

Official Railway Map of England and Wales. Scale 1 : 712,800 or 1 inch to 11·3 stat. miles. Prepared and published by the Railway Clearing House, London, 1909.

British Isles—London. **Grube**

The combined maps of London and 25 miles round. Scales 1 : 18,000 or 3·5 inches to 1 stat. mile, and 1 : 126,720 or 1 inch to 2 stat. miles. London : H. Grube, Ltd., [1908]. *Price* 1*s. net. Presented by the Publisher.*

British Isles—London. **Hollar.**

Hollar's "Exact Surveigh of the Streets, Lanes, and Churches contained within the Ruines of the City of London." Sheet 1. London : London Topographical Society, 1908.

The original of this most interesting old plan is in two sheets, measuring 33 inches by 21½ inches, and the reproduction is on the same scale. The western sheet is now published, and the eastern is to follow next year. The plan shows in a striking manner the extent of the destruction of the great fire, whilst a view of the actual conflagration is given on the top.

Europe—Baltic. **Philip.**

Philips' Timber and Mercantile Map of the Baltic. Scale 1 : 2,000,000 or 1 inch to 31·6 stat. miles. 4 Sheets, with index. London : G. Philip & Son, Ltd., [1908]. *Price* £2 2*s. net. Presented by the Publishers.*

A map of the Baltic sea, with the Gulfs of Finland and Bothnia, drawn on Mercator's projection. It contains the names of all places from which timber is exported. Rivers, canals, railways, and steamer routes are indicated, and in the case of the latter the distances between ports are given. Limits of tariff zones and of shipping districts are shown in red. The depths of the sea are indicated by different tints of blue. The position of lighthouses, lightships, docks, coaling stations, cables, places in which British consuls or vice-consuls reside, and other information specially useful to those interested in shipping in the Baltic will also be found on this map. An index to place-names is provided as a separate pamphlet.

Turkey. **Topographical Section, General Staff.**

Sketch-maps of Eastern and Western Turkey in Europe. Scale 1 : 800,000 or 1 inch to 12·6 stat. miles. London : Topographical Section, General Staff, War Office, 1908. *Price* 1*s. each. Presented by the Director of Military Operations.*

ASIA.

China—Chili. **K. Preuss. Landesaufnahme.**

Karte von Tschili und Schantung. Bearbeitet in der Kartogr. Abteilung der Kgl. Preuss. Landesaufnahme. Scale 1 : 200,000 or 1 inch to 3·2 stat. miles.

Sheets: C 13, Dschau dschou; C 14, Schun de fu; D 14, Lin tsing dschou; E 14, Gau tang dschou; F 14, Dschou tsun; G 14, Tsing dschou fu; H 14, Lai dschou fu; I 13, Deng dschou fu; I 14, Lai yang hsien; K 13, Tschifu; K 14, Hai yang hsien; L 13, Wei hai wei; L 14, Wen deng hsieu. Berlin: K. Preuss. Landesaufnahme, 1907.

India. **Varley.**

Mahableshwar Plateau. By F. J. Varley, F.R.G.S. Scale 1:31,680 or 2 inches to 1 stat. mile. Poona: Government Photozinco Office, 1908. *Presented by F. J. Varley, Esq.*

The Mahableshwar plateau is situated at a height of about 4500 feet about 60 miles south of Poona. As no plan of the district on a sufficiently large scale to suit his purpose previously existed, Mr. F. J. Varley, who is in the Indian Civil Service, and who had received instruction in surveying at the Society, undertook to construct one, principally from his own plane-table surveys, and the result is very creditable. It is printed in colours, form lines being in brown.

Indian Government Surveys. **Surveyor-General of India.**

India, showing railways with stations, scale 1 inch to 32 miles, 1907.—Indian atlas, scale 1 inch to 4 miles. Sheet 47 S.E., parts of districts Simla and Kangra, and of States Patiala, Jubbal, Suket Mandi, and Bashahr (Punjab), Dehra Dun and Garhwal (U.P.), 1908.—Bengal: Province of Bengal, scale 1 inch to 32 miles, 1908.—Districts maps, scale 1 inch to 8 miles. Sheets: Muzaffarpur, 1907; Nadia, 1906.—Bengal Survey, scale 1 inch to 1 mile. Sheets: 72 $\frac{J}{10 \& 14}$, parts of districts Darbhanga and Bhagalpur, 1907; 72 $\frac{K}{1 \& 5}$, 72 $\frac{K}{2 \& 6}$, parts of districts Darbhanga, Monghyr, and Bhagalpur, 1907; 73 $\frac{A}{10 \& 14}$, parts of districts Palamau, Hazaribagh, and Ranchi, 1907; 73 $\frac{E}{11 \& 15}$, parts of districts Ranchi, Hazaribagh, and Manbhum, 1907; 73 $\frac{I}{1 \& 6}$, parts of districts Manbhum and Hazaribagh, 1907; 77 $\frac{K}{3 \& 7}$, part of district Monghyr, 1907.—Eastern Bengal and Assam: District maps, scale 1 inch to 4 miles. Sheet: Chittagong, 1908.—Eastern Bengal and Assam Survey, scale 1 inch to 1 mile. Sheets: 78 $\frac{B}{12 \& 16}$, parts of districts Dinajpur, Jalpaiguri, and Rangpur (Eastern Bengal and Assam), and Cooch Behar State (Bengal), 1907; 78 $\frac{D}{11 \& 15}$, parts of districts Rajshahi (Eastern Bengal and Assam), and Murshabad (Bengal), 1907; 78 $\frac{F}{3 \& 7}$, parts of districts Jalpaiguri and Rangpur (Eastern Bengal and Assam), and Cooch Behar State (Bengal), 1907; 78 $\frac{N}{3 \& 7}$, part of district Kamrup, 1907.—Bombay: Bombay Survey, scale 1 inch to 1 mile. Sheets: 46 $\frac{B}{12 \& 16}$, parts of district Broach and Baroda and Cambay States, 1907; 46 $\frac{F}{3 \& 7}$, parts of district Kaira and Panch Mahals, Baroda State, and Rewa Kantha Agency, 1907; 46 $\frac{F}{4 \& 8}$, parts of district Broach, Baroda State, and Kewa Kantha Agency, 1907; 47 $\frac{K}{1 \& 5}$, parts of district Satara and Phaltan State, 1907; 47 $\frac{L}{3 \& 7}$, parts of district Belgaum and Kolhapur State, 1907; 48 $\frac{M}{10 \& 14}$, parts of district Dharwar and States Ramdurg (Bombay) and Hyderabad, 1907.—Levels in Sind, scale 1 inch to 2 miles. Sheet 64, parts of Sukkur, Upper Sind Frontier, and Dera Ghazi Khan, and of Kalat (Baluchistan) and Bahawalpur States, 1907.—Burma: Burma Survey, scale 1 inch to 1 mile. Sheets: 84 $\frac{D}{11 \& 15}$, part of district Akyab, 1907; 84 $\frac{L}{4}$, parts of districts Minbu and Kyaukpyu, 1907; 84 $\frac{L}{6}$, part of district Minbu, 1908; 84 $\frac{O}{10}$, parts of districts Myingyan and Sagaing, 1908; 93 $\frac{O}{3}$, 93 $\frac{O}{4}$, 93 $\frac{O}{7}$, 93 $\frac{O}{8}$, 93 $\frac{P}{1}$, 93 $\frac{P}{5}$, part of Kengtung (Southern Shan States), 1907–1908; 94 $\frac{A}{1}$, part of district Yamethin, 1908; 94 $\frac{A}{14}$, parts of Southern Shan States and Karenni, 1908; 94 $\frac{D}{4 \& 8}$, part of district Pya-pon, 1907; 94 $\frac{C}{12 \& 16}$, part of district Pegu, 1908.—Central India and

Rajputana, Jaipur State, scale 1 inch to 8 miles, 1906.—Central Provinces: Central Provinces Survey, scale 1 inch to 1 mile. Sheets: 55 $\frac{C}{4 \& 8}$, parts of districts East Khandesh (Bombay), Nimar, and Buldana (C.P.), 1907; 55 $\frac{I}{12}$, parts of district Narsinghpur (C.P.), and Bhopal State (C.I. Agency), 1908; 55 $\frac{K}{8}$, parts of districts Nagpur and Wardha, 1907; 55 $\frac{L}{1}$, parts of districts Amraoti and Wardha, 1908.—Madras: Madras Survey, scale 1 inch to 1 mile. Sheets: 57 $\frac{C}{10 \& 14}$, parts of districts Tumkur and Chitaldroog (Mysore), 1907; 57 $\frac{G}{2 \& 6}$, parts of districts Tumkur and Kolar (Mysore), and Anantapur (Madras), 1907; 57 $\frac{H}{10 \& 14}$, part of district Bangalore (Mysore), 1907.—Frontier Surveys: North-Western Trans-Frontier Series, scale 1 inch to 2 miles. Sheets: 331, parts of Afghanistan and Quetta-Pishin district (Baluchistan), 1907; 334, parts of districts Zhob and Quetta-Pishin (Baluchistan), and Maruf (Afghanistan), 1907; 335, parts of districts Quetta-Pishin, Loralai and Sibi and Zhob Agency, 1907; 361, parts of Las Bela State and Jhalawan (Kalat State), Baluchistan, 1907; 444, parts of Waziristan, Bannu, and Dera Ismail Khan districts, 1907; 445, parts of Peshawar and Kohat districts, and Peshawar Frontier, 1907; 458, parts of districts Dera Ismail Khan (N.W. Frontier Province), Dera Ghazi Khan, Mianwali (Punjab), and Zhob and Loralai (Baluchistan), 1907; 468, parts of districts Kohlu and Nasirabad, and railway (Baluchistan), 1907; 471; part of Bugti hills (Baluchistan), 1907.—North-Western Trans-Frontier, scale 1 inch to 4 miles. Sheets: 11 S.W., 11 S.E., 19 S.W., parts of Afghanistan and Persia, 1907; 28 S.W., parts of Afghanistan, Baluchistan, and Waziristan (N.W. Frontier Province), 1907.—North-Eastern Frontier, scale 1 inch to 4 miles. Sheets: 23 S.W., parts of districts Bhamo, Myitkyina, and Katha and Northern Shan States (Burma), and China (Yun-nan Province), 1907.—South-Eastern Frontier, scale 1 inch to 4 miles. Sheets: 1 S.E., parts of Upper and Lower Chindwin, Pakokku, Ye-u, Schwebo, Mandalay, and Sagaing districts (Upper Burma), 1907; 1 S.W., parts of districts Chin hills and Northern Arakan (Burma), Lushai hills (Assam), Chittagong and Chittagong hill-tracts (Bengal), 1907.—Punjab Survey, scale 1 inch to 1 mile. Sheets: 39 $\frac{I}{3 \& 7}$, parts of districts Dera Ghazi Khan (Punjab), and Dera Ismail Khan (N.W. Frontier), 1907; 39 $\frac{M}{3 \& 7}$, part of district Mianwali, 1907; 39 $\frac{N}{3}$, part of district Muzaffargarh, 1908; 39 $\frac{N}{7}$, 39 $\frac{O}{2}$, parts of districts Multan and Muzaffargarh, 1908; 39 $\frac{O}{3}$, parts of districts Multan and Muzaffargarh and Bahawalpur State, 1908; 39 $\frac{O}{6}$, part of district Multan, 1908; 265, districts Kangra and Hoshiarpur, 1907; 311, parts of districts Simla, Simla Hill States, Patiala, Suket, and Sirmur States, 1908; 335, parts of Sirmur State (Punjab), and district Dehra Dun (U.P.A. & O.); 1907.—United Provinces Survey, scale 1 inch to 1 mile. Sheets: 53 $\frac{G}{2 \& 6}$, parts of districts Karnal (Punjab), Saharanpur and Muzaffarnagar (U.P.), 1907; 53 $\frac{O}{1 \& 5}$, parts of districts Garhwal and Almora, 1907; 53 $\frac{O}{2 \& 6}$, parts of districts Garhwal, Almora, and Naini Tal, 1907; 54 $\frac{I}{2 \& 6}$, parts of districts Aligarh, Etah, and Muttra, 1907; 54 $\frac{I}{3 \& 7}$, parts of districts Aligarh, Etah, Muttra, and Agra, 1907; 63 $\frac{C}{2 \& 6}$, parts of districts Hamirpur and Banda and Charkhari State (C.I. Agency), 1907; 63 $\frac{N}{8}$, parts of district Azamgarh, 1907; 63 $\frac{O}{1}$, parts of districts Azamgarh and Ghazipur, 1907; 63 $\frac{O}{9}$, parts of districts Azamgarh, Ghazipur, and Ballia, 1907; 224, parts of Sirmur State (Punjab), and district Dehra Dun (U.P.A. & O.), 1907.—United Provinces, district maps, scale 1 inch to 4 miles. Sheets: Allahabad, 1907; Bahraich, 1908. Scale 1 inch to 8 miles, sheets: Agra, 1906; Ballia, 1906; Bara Banki, 1902; Budaun, 1906; Jaunpur, 1906. Calcutta: Surveyor-General's Office, 1908. *Presented by the Secretary of State for India, through the India Office.*

AFRICA.

Algeria. **Bourgeois.**

Plan de la Ville d'Alger. Edité par E. le Bourgeois, Directeur du Gd. Annuaire Général de l'Algérie, de la Tunisie et du Maroc. Scale 1 : 7500 or 8·4 inches to 1 stat. mile. Paris: L. Theuveny, [1908].

Egypt. **Survey Department, Cairo.**

Topographical map of Aswan Province. Scale 1 : 10,000 or 6·3 inches to 1 stat. mile. Sheets: S.E., 126–37, 126–39, 127–37, 127–38, 127–39, 128–37, 128–38, 129–37. Cairo: Survey Department, 1908. *Presented by the Director-General, Survey Department, Cairo.*

Gold Coast. **Guggisberg.**

Wall Map of the Gold Coast Colony, Ashanti and the Northern Territories. Prepared for the use of the Gold Coast Government Schools by Major F. G. Guggisberg, C.M.G., R.E. Scale 1 : 400,000 or 1 inch to 6·3 stat. miles. 4 sheets. Edinburgh and London: W. & A. K. Johnston, Ltd., 1908.

A four-sheet school wall-map, drawn in a bold style, and clearly printed in colours. Only the principal names are given, and the map should serve well for the special purpose for which it is intended.

Orange River Colony. **Murray and Cannon.**

Map of the Orange river Colony. Compiled from recent surveys, diagrams, and other reliable sources by A. C. Murray, C.E., and Reginald Cannon, A.M.I.M.E. Scale 1 : 253,440 or 1 inch to 4 stat. miles. 6 sheets. London: Edward Stanford, [1908]. *Presented by the Publisher.*

This is virtually a republication of the map noticed in the *Geographical Journal* for January last. The style of execution is decidedly superior to that of the earlier issue, and it is clearly printed in colours.

AMERICA.

British Guiana. **Harrison, Perkins, and Anderson.**

Map of the northern portion of British Guiana showing the geology of the courses of the principal river and auriferous areas, from observations made by J. B. Harrison, M.A., C.M.G., F.G.S., Government geologist; H. J. Perkins, I.S.O., F.G.S., Assistant Commissioner of Lands and Mines; and C. Wilgress Anderson, F.G.S., F.R.G.S., Government Surveyor. Scale 1 : 633,600 or 1 inch to 10 stat. miles. Compiled by C. Wilgress Anderson, F.G.S. Georgetown, Demerara: Department of Lands and Mines, 1908.—Map of the northern portion of British Guiana. Scale 1 : 633,600 or 1 inch to 10 stat. miles. London: Edward Stanford, 1908. *Price 4s. Presented by the Publisher.*

Mr. C. Wilgress Anderson, during his lengthy residence in British Guiana, did a great deal of most useful exploratory work in the interior of the colony. This map has been compiled by him from his own surveys and from the geological observations of Messrs. Harrison & Perkins, combined with all other available material. It will be seen at a glance that away from the river courses the greater part of the region still remains unexplored. The map is published in two forms, one showing geology and auriferous areas in various colours and symbols, and the other geographical features only.

Canada. **Geological Survey, Ottawa.**

Map of Canada showing minerals. Compiled under the direction of James White, F.R.G.S., Geographer, Department of the Interior. Scale 1 : 6,336,000 or 1 inch to 100 stat. miles. Ottawa: Department of Mines, Geological Survey Branch, 1908. *Presented by the Geological Survey of Canada.*

A most instructive map, showing by different colours and symbols the location of minerals in the Dominion. The northern limit of the regions that have been prospected is indicated by a red line, beyond which nothing is known of the mineral resources except along some of the principal rivers.

Canada. **Geological Survey, Ottawa.**

Geological Survey of Canada. Nova Scotia: plans and sections of the gold districts of Brookfield, Caribou, Catcha lake, Cochran, Fifteen-mile stream, Forest Hill, Harrigan Cove, Gold river, Isaacs harbour, Killag, Lawrencetown, Leipsigate, Malaga, Montagne, Mooseland, Moose river, Mount Uniacke, Oldham, Renerew, Salmon river, South Uniacke, Tangier, Upper Seal harbour, Waverley, Wine harbour. Ottawa: Department of Mines, Geological Survey of Canada, 1898–1908. *Presented by the Geological Survey of Canada.*

Canada—Nova Scotia. **Geological Survey, Ottawa.**

Map of the province of Nova Scotia to illustrate the report by E. R. Faribault, B.A.SC., on the "Gold Fields of Nova Scotia." Scale 1 : 760,320 or 1 inch to 12 stat. miles. Ottawa: Geological Survey of Canada, 1906. *Presented by the Geological Survey of Canada.*

United States. **Department of the Interior, Washington.**

State maps compiled from the official records at the General Land Office and other sources. Scale 1 : 760,320 or 1 inch to 12 stat. miles. California, Colorado, Idaho, Michigan, Minnesota, New Mexico, Oklahoma, Wyoming. Washington: Department of the Interior, General Land Office, 1904–08.

AUSTRALASIA.

Queensland. **Dunstan and Fox.**

Geological sketch-map of Queensland showing mineral localities. Prepared under the supervision of B. Dunstan, F.G.S., Acting Government Geologist, and compiled by H. W. Fox. Scale: 1 : 2,500,000 or 1 inch to 39·4 stat. miles. Third edition. Brisbane: Geological Survey of Queensland, 1908. *Presented by the Geological Survey of Queensland.*

Queensland. **Greenfield.**

Sketch-map of the Etheridge Goldfield. Prepared at the Geological Survey Office, Department of Mines, by W. H. Greenfield. Scale 1 : 380,160 or 1 inch to 6 stat. miles. Brisbane: Geological Survey of Queensland, 1908. *Presented by the Geological Survey of Queensland.*

The Etheridge goldfield is situated in central Queensland in about lat. 18° 30′ S. and long. 143° E. A list of the mineral leases with their acreages is given at the side of the map.

Queensland. **Greenfield.**

Queensland, showing principal mining centres and railways. By W. H. Greenfield. Scale 1 : 6,000,000 or 1 inch to 94·7 stat. miles. Brisbane: Geological Survey of Queensland, 1908. *Presented by the Geological Survey of Queensland.*

GENERAL.

World. **Dickinson and Andrews.**

The "Diagram" Hand-maps. Designed by B. B. Dickinson, M.A. and A. W. Andrews, M.A. Eastern Alps, Greece, Iberian peninsula, Russia, Switzerland, South-east Asia. London: George Philip & Son, Limited, [1908]. *Price 1d. each. Presented by the Publishers.*

These form part of the authors' well-known useful series of orographically coloured school hand-maps.

World. **Elton.**

The Class-room Atlas of physical, political, biblical, and classical geography. Edited by Edward F. Elton, M.A. Third edition, revised. Edinburgh: W. & A. K. Johnston, Limited, 1908. *Price 5s. Presented by the Publishers.*

The Class-room Atlas is already well known, and that it has been found necessary to publish a third edition speaks well for the manner in which it has been received. It is essentially a school atlas, intended for teaching purposes rather than for general reference; hence few names and no unnecessary detail are given. Generally considered, the maps are creditable productions, and the representation of land elevation and ocean depths by colour tinting gives at a glance a good idea of the characteristic surface features, although in some instances there is hardly sufficient distinction between the tints. In this edition additions have been made, and the maps have been thoroughly revised. In his introduction Mr. Elton acknowledges his indebtedness to Dr. Herbertson and others, from whom he has received advice and assistance. This is a decidedly cheap and good atlas for the purpose for which it is intended.

World. **Kiepert.**

Formæ Orbis Antiqui. 36 Karten im Format von 52 : 64 cm. mit Kritischen Text und Quellenangabe zu jeder Karte. No. vii. Asia Minor cum oris Ponti Euxini ante dominationem Romanorum (Anno 188 a Chr. n.). Mit 4 Seiten Text.

Bearbeitet und herausgegeben von Richard Kiepert. Berlin: Dietrich Reimer (Ernst Vohsen), 1908. *Price 3m. each sheet.*

This sheet includes Asia Minor and the shores of the Black sea, with the political divisions as they existed about the year 188 B.C., before the Roman domination. Text giving the authorities consulted and other useful information accompanies the sheet.

World. **St. Martin and Schrader.**

Atlas Universel de Géographie construit d'après les sources originales et les documents les plus récents, cartes, voyages, mémoires, travaux géodésiques, etc., avec un texte analytique. Ouvrage commencé par M. Vivien de Saint Martin et continué par F. Schrader. Sheet, No. 75. États-Unis d'Amérique, sud-ouest. Paris: Hachette et Cie., 1908. *Presented by the Publishers.*

Like all others in this atlas, this sheet is well drawn and engraved, but owing to the hill work being printed in black, the lettering in parts is very much obscured, and is hardly legible without a glass.

World. **Vidal-Lablache.**

Atlas général Vidal-Lablache; Histoire et Geographie. 420 Cartes et Cartons, Index alphabetique de 46,000 noms. Livraisons 1, 2. Paris: Armand Colin, 1909 [1908]. *Price 1 fr. 10 net each part.*

These are the first two parts of the new edition of Prof. Vidal-Lablache's well-known general atlas, which was first published about fifteen years ago. The general design remains the same, and, as was the case with the earlier edition, the atlas will consist of two sections—historical and geographical. All the maps have been subjected to revision, many of them have been practically redrawn, and some will appear on larger scales than before. The atlas will consist altogether of twenty-six parts, one of which will appear on the 10th and 25th of each month.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during October, 1908. *Presented by the Hydrographer, Admiralty.*

New Charts.

No.	Inches.	
3714 m =	2·85	Norway, Christiana fiord:—Filtvet to Langaaren. 3*s.*
3680 m =	1·3	Baltic, Gulf of Bothnia:—Fögleö to Utö. 3*s.*
3707 m =	25·0	Malta: Grand harbour, mooring sheet. 5*s.*
3699 m =	{0·97} {1·95}	Korea:—Approaches to Sajan Kaye (*Shoal gulf*). Plan:—Entrance to Sajan Kaye. 3*s.*
3692 m =	0·7	Japan, Kiusiu, west coast:—Shimabara Kaiwan. 3*s.*

New Plans and Plans added.

1813 m =	5·7	South America, west coast, sheet XVII.:—Port Paita to Ayangui point. Plan added:—Lobitos cove. 2*s.*

Charts that have received Important Corrections.

No. 3146, Scotland, west coast:—Loch Ewe. 1479, Norway: The Naze to the North cape. 2214, The Euxine or Black sea. 2232, Black sea, sheet III.:—Odessa to Sevastopol. 2379, Black sea:—Kherson or Dnieprbay. 2233, Black sea, sheet IV.:—Sevastopol to Kertch strait. 3111 Colombia:—Colon harbour. 2001, South America. east coast:—Monte Video bay. 631, South America, west coast:—Smyth channel from south entrance to Fortune bay. 1654, Island of Java, eastern portion. 1696, Eastern archipelago:—Lombok to Flores, including Paternoster and Postillon islands. 1957, China, east coast:—Namoa islands. 166, China, east coast: Pagoda anchorage and approaches. 1601, China, north-east coast: Wusung river or Hwang pu. 3585, China, north-east coast:—Approaches to the Wusung river. 2763, Australia, east coast:—Coral sea and Great Barrier reef.

(*J. D. Potter, Agent.*)

Indian Ocean and Red Sea. **Meteorological Office.**

Monthly meteorological charts of the Indian Ocean north of 15° S. lat. and Red Sea, December, 1908. London: Meteorological Office, 1908. *Price 6d. each. Presented by the Meteorological Office.*

North Atlantic and Mediterranean. **Meteorological Office.**

Monthly meteorological charts of the North Atlantic and Mediterranean, December, 1908. London: Meteorological Office, 1908. *Price 6d. each. Presented by the Meteorological Office.*

North Atlantic. **U.S. Hydrographic Office.**

Pilot chart of the North Atlantic Ocean, November, 1908. Washington: U.S. Hydrographic Office, 1908. *Presented by the U.S. Hydrographic Office.*

North Pacific. **U.S. Hydrographic Office.**

Pilot chart of the North Pacific Ocean, December, 1908. Washington: U.S. Hydrographic Office, 1908. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

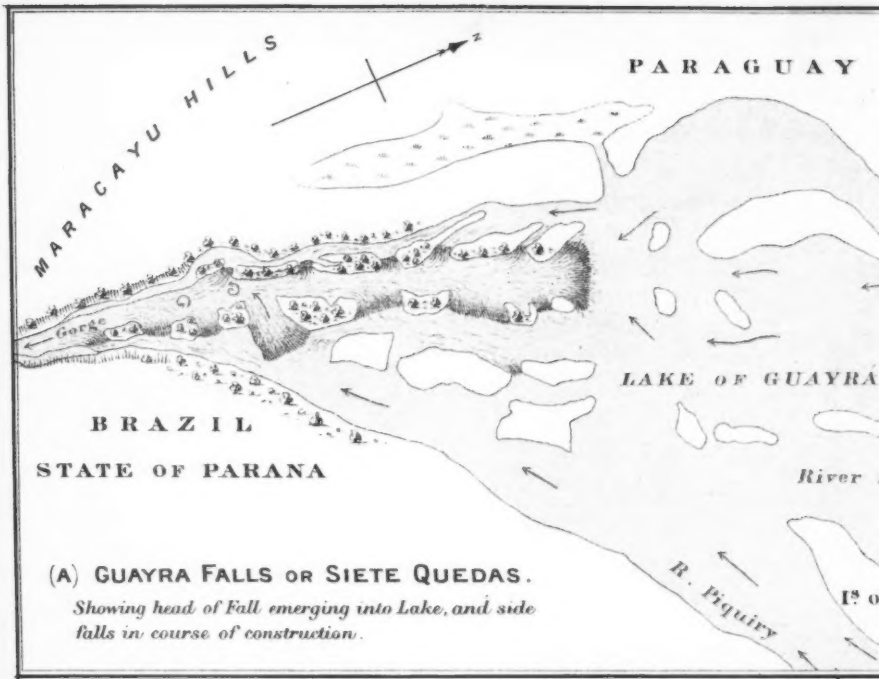
South America.

Fifty-five photographs of South America. *Presented by W. S. Barclay, Esq.*

Many of these photographs were exhibited as lantern slides when Mr. Barclay read his paper before the Society a short time ago. They form a remarkably good and instructive set.

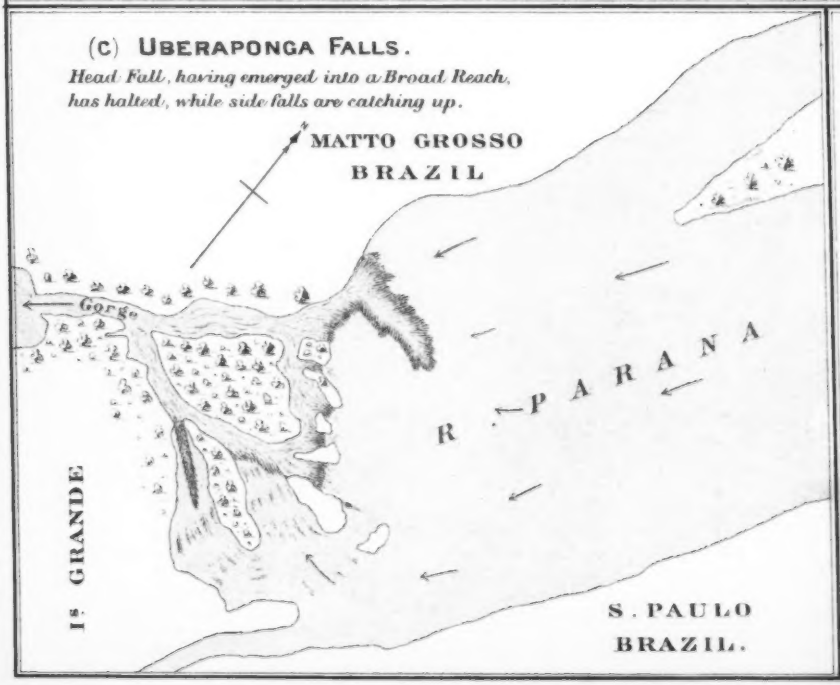
(1) Remains of the Jesuit colony of S. Ignacio, Misiones; (2) A "Vaucho" in Northern Argentina; (3) Cattle reared in the backwoods of Paraguay; (4) Sao Paulo and Santos railway at the coast flats; (5 and 6) Sao Paulo and Santos railway descending the Serra do Mar; (7) Part of the line from Santos to Sao Paulo, Serra do Mar; (8) Sao Paulo and Santos railway, station at Sao Paulo; (9) Rio de Janeiro bay and Sugar loaf, looking down from the hills; (10) Paranagua, looking inland to the Serra do Mar; (11) Curitiba railway, Serra do Mar; (12) Mountain railway from Paranagua to Curitiba; (13) River steamer on the Paraná river; (14) A squatter's clearing in the Alto Paraná; (15) The limestone cliffs of Entre Rios, showing lime-kilns; (16) How our shirts wear out; (17) The Paraná flats, showing the limestone cliffs; (18) The town of Paraná, capital of Entre Rios province; (19) The falls of the Iguazu river, the Argentine horseshoe; (20) The falls of the Iguazu river, the Brazilian falls; (21) Old Buenos Aires (1889), site of present docks; (22) Buenos Aires twenty years ago, the old River Plate frontage below the Plaza Mayo; (23) Modern Buenos Aires (1902), the Plaza de Mayo and Government House; (24) Modern Buenos Aires, Avenida de Mayo; (25) Loading grain at Rosario, river Paraná; (26) Virgin forest in Paraná state near the Iguazu river; (27) A "rossa" or squatter's clearing in the forest, Paraná state; (28) A "caboclo" hut, South Brazil; (29) "Cuidad Velha," curious eroded sandstones on the coast plateau of South Brazil; (30) The pines of Paraná state; (31) A backwoods Italian colony in the Paraná state; (32) Manoel, my "camarada" in Brazil; (33) A modern estancia in Argentina: first round-up of Durham cows; (34) Our dinner; (35) Cattle work, Argentina; (36) The old style, taking out stores to the "outside camps," a six months' trip; (37) Argentina peon; (38) Rancho, Entre Rios; (39) Our start with the troop; (40) A native woman and rancho, Corrientes; (41) A common inhabitant of the water-holes on the Entre Rios and Corrientes stations; (42) Branding; (43) Guitar and maté drinking, Argentina; (44) An old timer, Entre Rios; (45) Crossing the ford, Paraná swamps; (46) Country roads in Entre Rios; (47) A "gaucho fight" with skinning-knives; (48) "Good-bye," native Argentina girl; (49) A friendly game during the mid-day siesta; (50) Bringing in the wool crop, on the Southern Argentina pampas; (51–53) A modern estancia, Argentina; (54) Chaco Indians; (55) Leaf of yerba-maté plant.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.



(A) GUAYRA FALLS OR SIETE QUEDAS.

Showing head of Fall emerging into Lake, and side falls in course of construction.



(C) UBERAPONGA FALLS.

Head Fall, having emerged into a Broad Reach, has halted, while side falls are catching up.

Published by the Royal Geog

THE GEOGRAPHICAL JOURNAL 1909.

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ver Parana

Is OF GUAYRA

SOUTH AMERICA

THE EVOLUTION OF FALLS

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ALTO PARANA

Scale 1:40,000 or 1 Inch=0·63 Statute Mile.

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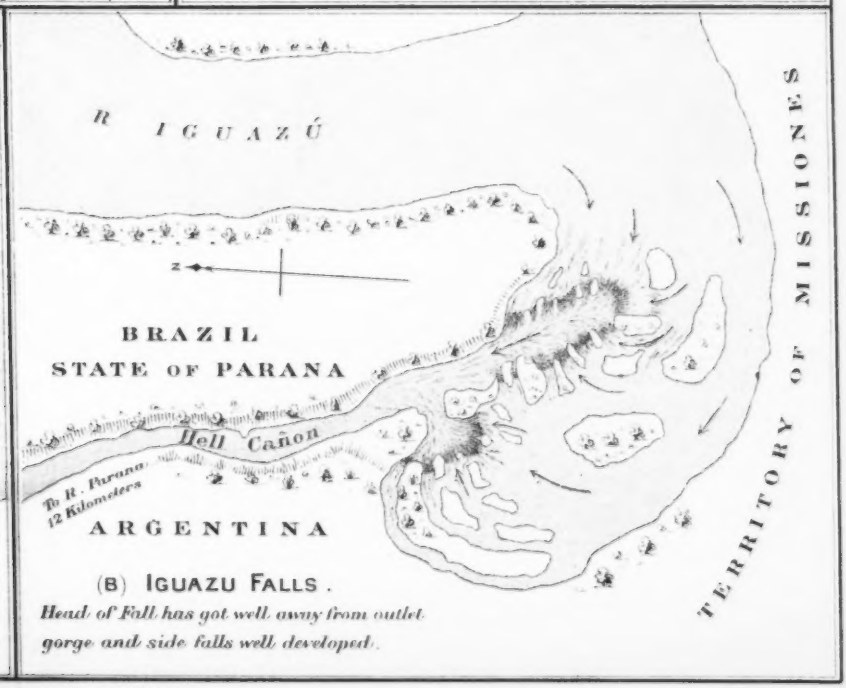
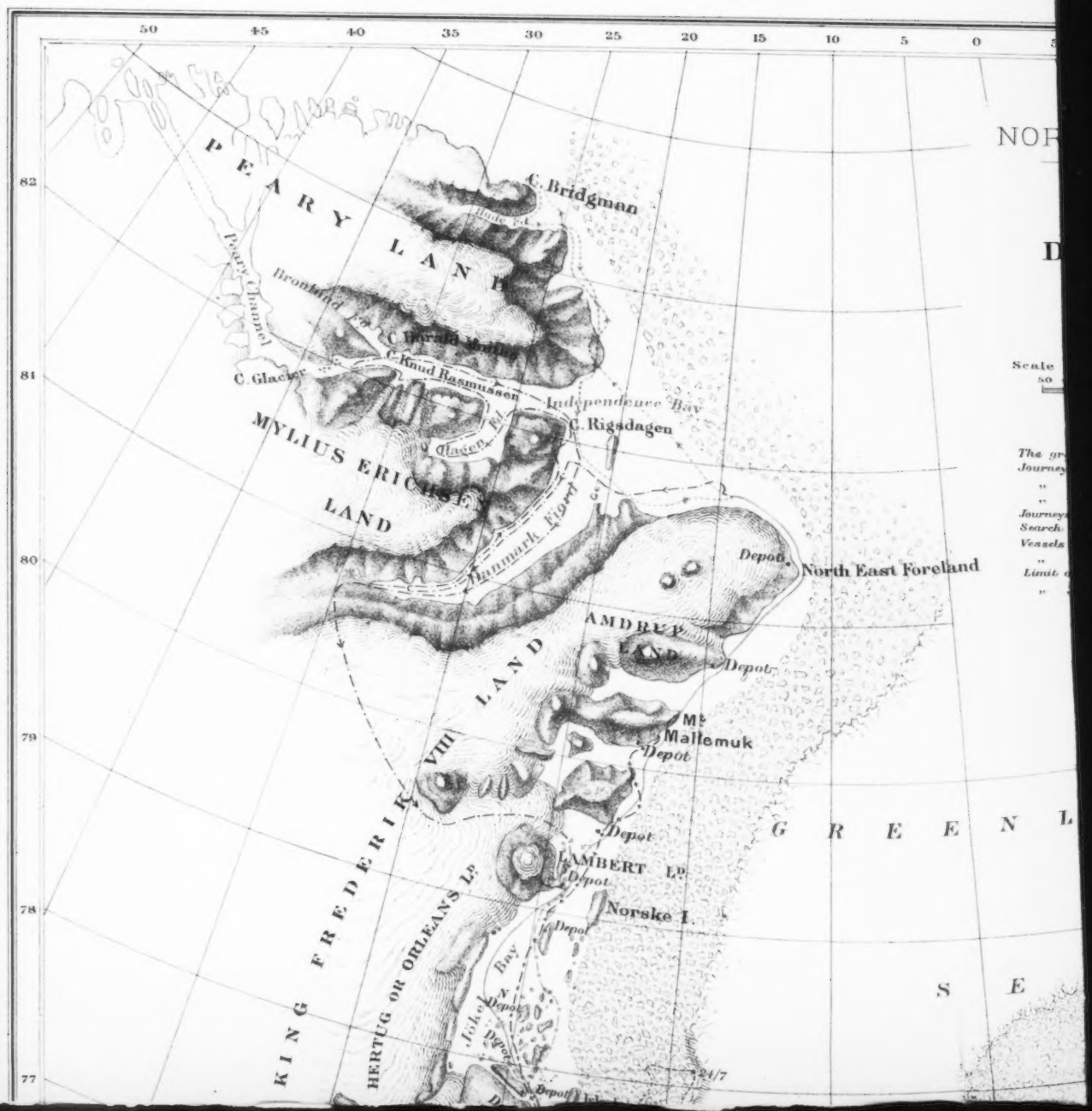


(B) IGUAZU FALLS.

Head of Fall has got well away from outlet gorge and side falls well developed.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PEARY LAND
C. Bridgman
Peary Channel
Bronlund Fd.
C. Borup
C. Knud Rasmussen
C. Glacier
Independence Bay
C. Rigsdagen
Glacier Fd.
MYLIUS ERICHSEN LAND
Denmark Fjord
Depot
North East Foreland
AMDRUP LAND
Depot
VIII LAND
Mt Mallemuk
Depot
Depot
LAMBERT Lp
Depot
Norske I.
Depot
KING FREDERIK
HERTUG OR ORLEANS Lp
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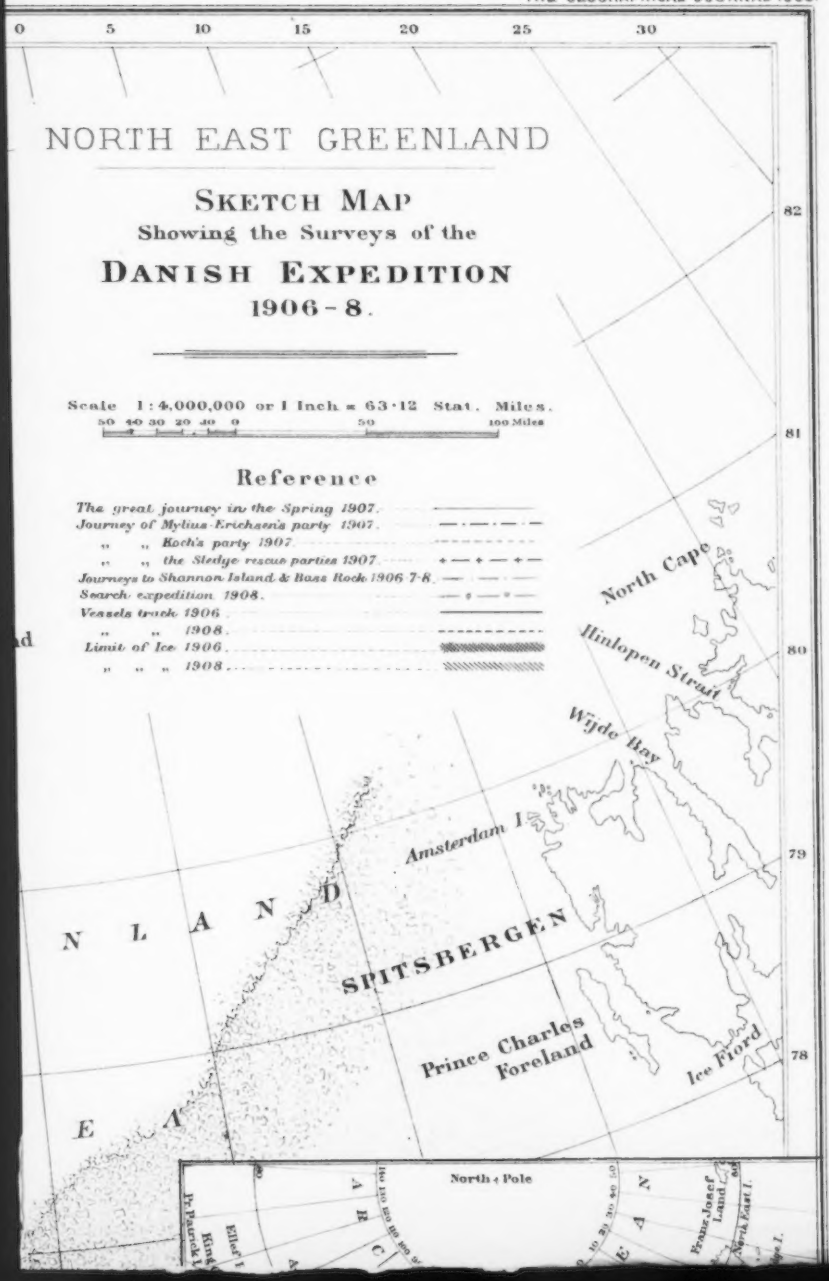
0 5 10 15 20 25 30
NORTH EAST GREENLAND
SKETCH MAP
Showing the Surveys of the
DANISH EXPEDITION
1906-8.
Scale 1:4,000,000 or 1 Inch = 63·12 Stat. Miles.
50 40 30 20 10 0 50 100 Miles
Reference
The great journey in the Spring 1907.
Journey of Mylius-Erichsen's party 1907.
" " Koch's party 1907.
" " the Sledge rescue parties 1907.
Journeys to Shannon Island & Bass Rock 1906 7-8.
Search expedition 1908.
Vessels track 1906.
" " 1908.
Limit of Ice 1906.
" " " 1908.
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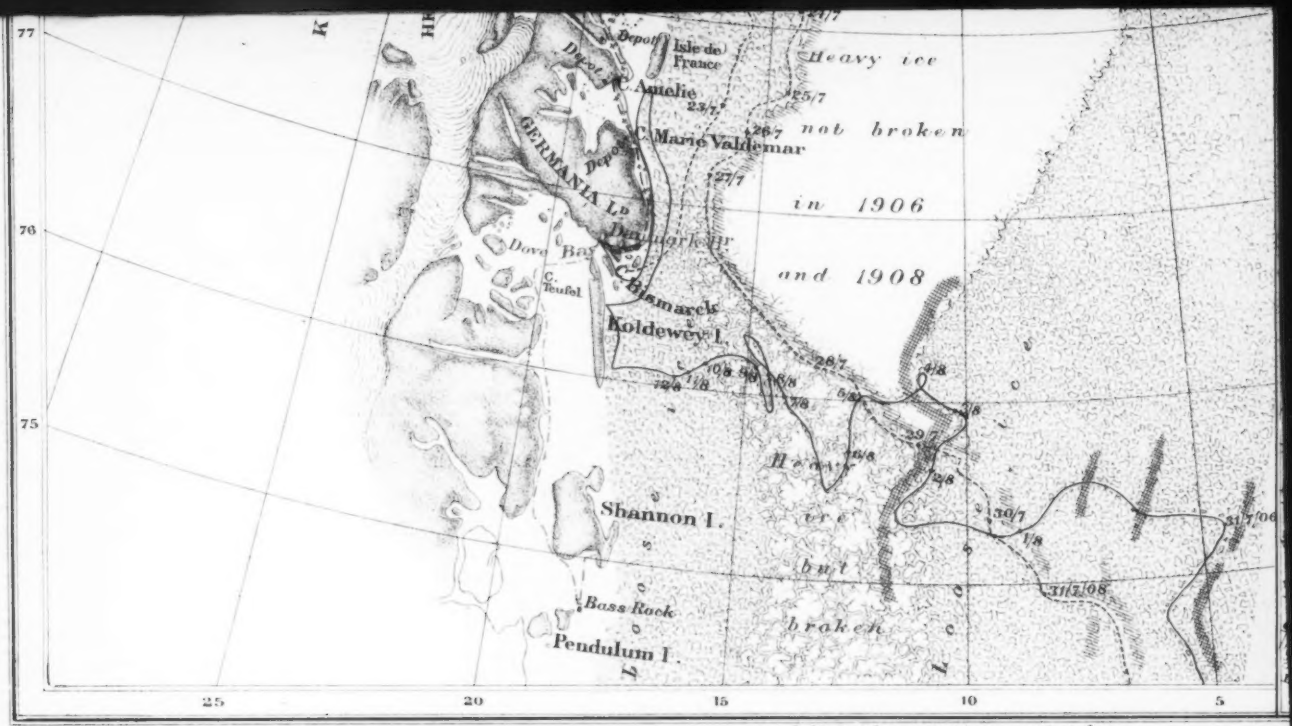
North Cape
Hinlopen Strait
Wijde Bay
Amsterdam I.
SPITSBERGEN
Prince Charles Foreland
Ice Fiord
North Pole
Franz Josef Land
North East I.



Conical Projection with Standard Parallels 76° and 82°.

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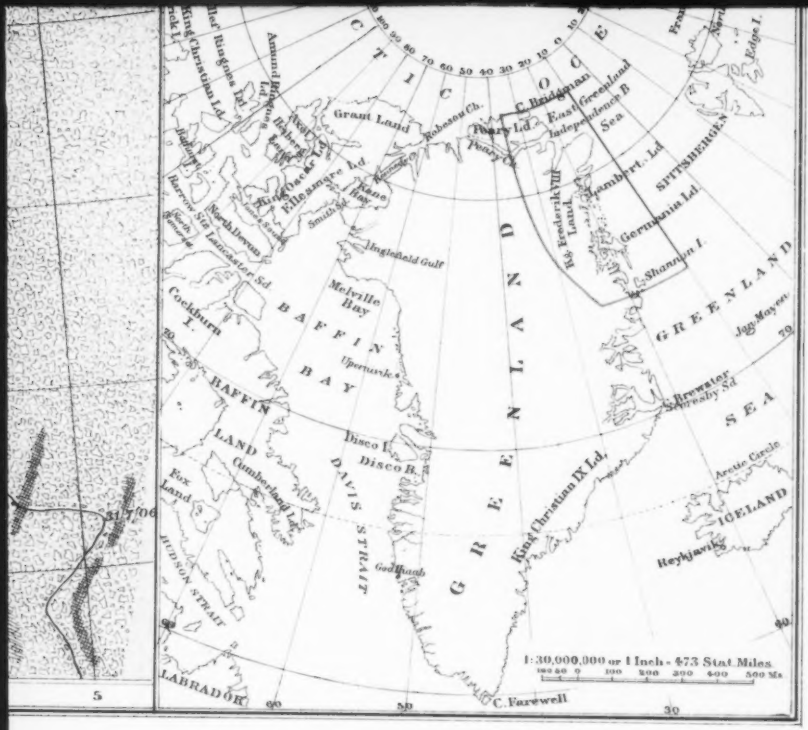
ATLANTIC OCEAN
Grant Land
Robeson Ch.
Peary Land
Peary Ch.
C. Bridgman
East Greenland
Independence B
Sea
Franz Josef Land
Edge I.
Nordenskiöld Land
Hamberg Land
SPITSBERGEN
Wijde Bay
Germania Ld.
Shannon I.
Hinlopen Str.
Hinlopen Str.
Hinlopen Str